**ORDINANCE _____**

AN ORDINANCE relating to the Seattle Mechanical Code, amending Chapter 22.400.010 of the Seattle Municipal Code, and adopting by reference Chapters 2 through 9, and Chapters 11 through 15 of the 2009 International Mechanical Code, and amending certain of those chapters; adopting a new Chapter 1 related to administration, permitting and enforcement; and repealing Sections 2-12 of Ordinance 122531.

**BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:**

Section 1. Section 22.400.010 of the Seattle Municipal Code is amended as follows:

**22.400.010 Adoption of International Mechanical Code.**

The Seattle Mechanical Code consists of: 1) the following portions of the ((~~2006~~)) 2009 edition of the International Mechanical Code published by the International Code Council, as amended by City Council by ordinance ((~~, and all errata published by the International Code Council after February 1, 2006,~~)): Chapters 2 through 9, Chapters 11 through 15, and 2) Chapter 1 relating to administration, permitting and enforcement adopted by City Council ordinance. One copy of the ((~~2006~~)) 2009 International Mechanical Code is filed with the City Clerk in C.F. ((~~308940~~)) _____.

Section 2. Chapter 1 of the Seattle Mechanical Code is adopted to read as follows:

**CHAPTER 1**

**ADMINISTRATION**

**SECTION 101**

**TITLE**

**101.1 Title.** These regulations shall be known as the "Seattle Mechanical Code," may be cited as such, and are referred to herein as "this code." All references to the *International Mechanical Code* contained in this code mean the *Seattle Mechanical Code*.

**SECTION 102**

**PURPOSE**

**102.1 Purpose.** The purpose of this code is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation, and maintenance or use of heating, ventilating, cooling, refrigeration systems, incinerators and other miscellaneous heat–producing appliances within the City.

The purpose of this code is to provide for and promote the health, safety and welfare of the general public, and not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by the terms of this code.

**SECTION 103**

**APPLICABILITY AND SCOPE**

**103.1 Applicability.** The provisions of this code apply to the erection, installation, alteration, repair, relocation, replacement, addition to, use or maintenance of any heating, ventilating, cooling, refrigeration systems, incinerators or other miscellaneous heat-producing appliances within the City. The design and testing of equipment regulated by this code are subject to the approval of the code official.

**Exceptions:**

1. Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane with a separate means of egress and their accessory structures shall comply with the *International Residential Code*.

2. The standards for liquefied petroleum gas installations are the 2008 edition of NFPA 58 (Liquefied Petroleum Gas Code) and the 2009 edition of ANSI Z223.1/NFPA 54 (National Fuel Gas Code), as amended.

**103.2 Applicability of Seattle Mechanical Code.** A mechanical permit application shall be considered under the Seattle Mechanical and Seattle Energy codes in effect on the date a complete mechanical permit application is submitted or on a date as otherwise required by law. A mechanical permit application is complete if it complies with all the requirements of Section 115.

**103.3 Alterations.** Additions, alterations, repairs and replacement of equipment or systems shall comply with the provisions for new equipment and systems except as otherwise provided in Section 104 of this code.

**103.4 Internal consistency.** Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive governs. Where there is a conflict between a general requirement and a specific requirement, the specific requirement is applicable.

**103.5 Referenced codes and standards.** The codes and standards referenced in this code are part of the requirements of this code to the extent prescribed by each such reference. Where

differences occur between provisions of this code and referenced codes and standards, the provisions of this code apply.

**Exception:** Where enforcement of a code provision would violate the conditions of the listing of the equipment or appliance, the conditions of the listing and manufacturer's instructions apply.

**103.6 Appendices.** Provisions in the *International Mechanical Code* appendices do not apply unless specifically adopted.

**103.7 Metric units.** Wherever in this ordinance there is a conflict between metric units of measurement and English units, the English units govern.

**103.8 References to other codes.** Whenever an International, National or Uniform Code is referenced in this code, it means the Seattle edition of that code, including local amendments. References to the "Building Code", "Fuel Gas Code", "Fire Code", "Residential Code" and "Plumbing Code" mean the Seattle editions of those codes.

## SECTION 104

## APPLICATION TO EXISTING MECHANICAL SYSTEMS

**104.1 Additions, alterations or repairs.** Additions, alterations, renovations or repairs may be made to any mechanical system without requiring the existing mechanical system to comply with all the requirements of this code, if the addition, alteration, renovation or repair conforms to the standards required for a new mechanical system. Additions, alterations, renovations or repairs shall not cause an existing system to become unsafe, unhealthy or overloaded.

Minor additions, alterations, renovations, and repairs to existing mechanical systems may be installed in accordance with the law in effect at the time the original installation was made, if approved by the code official.

**104.2 Existing installations.** Mechanical systems lawful at the time of the adoption of this code may continue their use, be maintained or repaired, be converted to another type of fuel, or have components replaced if the use, maintenance, repair, conversion of fuel, or component replacement is done in accordance with the basic original design and location, and no hazard to life, health or property has been or is created by such mechanical system.

**104.3 Changes in building occupancy.** Mechanical systems that are a part of a building or structure undergoing a change in use or occupancy as defined in the Building Code shall comply with all requirements of this code that are applicable to the new use or occupancy.

**104.4 Maintenance.** All mechanical systems, materials, equipment, appurtenances and all parts thereof shall be maintained in proper operating condition in accordance with the original design and in a safe and hazard-free condition. All devices or safeguards that were required by a code in effect when the mechanical system was installed shall be maintained in conformance with the code edition under which installed. The owner or the owner's designated agent is responsible for maintenance of mechanical systems and equipment. To determine compliance with this subsection, the code official may cause a mechanical system or equipment to be reinspected.

The fire chief and the code official each have authority to obtain compliance with the requirements of this subsection.

**Exception:** The code official may modify the requirements of this section where all or a portion of the building is unoccupied.

**104.5 Moved buildings.** Building or structures moved into or within the City shall comply with standards adopted by the code official. No building shall be moved into or within the City unless, prior to moving, the code official has inspected the building for compliance with this code and the permit holder has agreed to correct all deficiencies found and has been issued a building permit for the work. A bond or cash deposit in an amount sufficient to abate or demolish the building shall be posted prior to issuance of a permit. See Section 116 for information required on plans. Any moved building that is not in complete compliance with standards for moved buildings within eighteen months from the date of permit issuance and is found to be a public nuisance may be abated.

**104.6 Historic buildings and structures.** The code official may modify the specific requirements of this code as it applies to landmarks and require in lieu thereof alternate requirements that, in the opinion of the code official, will result in a reasonable degree of safety to the public and the occupants of those buildings.

For purposes of this section a landmark is a building or structure that has been nominated for designation or has been designated for preservation by the City Landmarks Preservation Board, or that has been designated for preservation by the State of Washington, or has been listed or determined eligible to be listed in the National Register of Historic Places, or is a structure in a landmark or special review district subject to a requirement to obtain a certificate of approval before making a change to the external appearance of the structure.

## SECTION 105

## ALTERNATE MATERIALS AND METHODS OF CONSTRUCTION

**105.1 Alternate materials and methods.** This code does not prevent the use of any material, design or method of construction not specifically allowed or prohibited by this code, provided the alternate has been approved and its use authorized by the code official. The code official may approve an alternate, provided the code official finds that the proposed alternate complies with the provisions of this code and that the alternate, when considered together with other safety features of the building or other relevant circumstances, will provide at least an equivalent level of strength, effectiveness, fire resistance, durability, safety and sanitation. The code official may require that sufficient evidence or proof be submitted to reasonably substantiate any claims regarding the use or suitability of the alternate. The code official may, but is not required to, record the approval of alternates and any relevant information in the files of the code official or on the approved construction documents.

## SECTION 106

## MODIFICATIONS

**106.1 Modifications.** The code official may modify the provisions of this code for individual cases if the code official finds: (1) there are practical difficulties involved in carrying out the provisions of this code; (2) the modification is in conformity with the intent and purpose of this code; and (3) the modification will provide a reasonable level of strength, effectiveness, fire resistance, durability, safety and sanitation when considered together with other safety features of the building or other relevant circumstances. The code official may, but is not required to, record

the approval of modifications and any relevant information in the files of the code official or on the approved construction documents.

## SECTION 107

## TESTS

**107.1 Tests.** Whenever there is insufficient evidence of compliance with the provisions of this code or evidence that any material or method of construction does not conform to the requirements of this code, the code official may require tests as proof of compliance, to be made at no expense to the City. Test methods shall be as specified in this code or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the code official shall determine the test procedures. All tests shall be made by an approved agency. Reports of such tests shall be retained by the code official for the period required for retention of public records.

## SECTION 108

## ORGANIZATION AND DUTIES OF CODE OFFICIAL

**108.1 Jurisdiction.** The Department of Planning and Development is authorized to administer and enforce this code. The Department of Planning and Development is under the administrative and operational control of the Director, who is the code official.

**108.2 Designees.** The code official may appoint such officers, inspectors, assistants and employees as are authorized from time to time. The code official may authorize such employees and other agents as may be necessary to carry out the functions of the code official.

**108.3 Right of entry.** With the consent of the owner or occupier of a building or premises, or pursuant to a lawfully issued warrant, the code official may enter a building or premises at any reasonable time to perform the duties imposed by this code.

**108.4 Liability.** Nothing in this code is intended to be nor shall be construed to create or form the basis for any liability on the part of the City, or its officers, employees or agents, for any injury or damage resulting from the failure of equipment to conform to the provisions of this code, or by reason or as a consequence of any inspection, notice, order, certificate, permission or approval authorized or issued or done in connection with the implementation or enforcement of this code, or by reason of any action or inaction on the part of the City related in any manner to the enforcement of this code by its officers, employees or agents.

This code shall not be construed to lessen or relieve the responsibility of any person owning, operating or controlling any equipment, building or structure for any damages to persons or property caused by defects, nor shall the Department of Planning and Development or the City of Seattle be held to have assumed any such liability by reason of the inspections authorized by this code or any permits or certificates issued under this code.

**108.5 Cooperation of other officials and officers.** The code official may request, and shall receive so far as is required in the discharge of the code official's duties, the assistance and cooperation of other officials of the City of Seattle.

**108.6 Responsibility for compliance.** Compliance with the requirements of this code is the obligation of the owner of the building, structure or premises, the duly authorized agent of the

owner, and other persons responsible for the condition or work, and not of the City or any of its officers, employees or agents.

## SECTION 109

## UNSAFE EQUIPMENT AND HAZARD CORRECTION ORDER

**109.1 Unsafe equipment.** Any equipment regulated by this code that is found to be unsafe is hereby declared to be a public nuisance and may be abated.

**109.2 Emergency order**. Whenever the code official finds that any equipment regulated by this code is in such a dangerous and unsafe condition as to constitute an imminent hazard to life or limb, the code official may issue an emergency order directing that the equipment be restored to a safe condition by a date certain. The order may also require that the building, structure or premises, or portion thereof, containing the equipment be vacated within a reasonable time to be specified in the order. In the case of extreme danger, the order may specify immediate vacation of the building, structure or premises, or may authorize immediate disconnection of the utilities or energy source.

**109.2.1 Service of emergency order.** The order shall be posted on the premises or personally served on the owner of the building or premises or any person responsible for the condition. The order shall specify the time for compliance.

**109.2.2 Effect of emergency order.** No person may occupy a building, structure or premises, or portion thereof, after the date on which the building is required to be vacated until the building, structure or premises, or portion thereof, is restored to a safe condition as

required by the order and this code. It is a violation for any person to fail to comply with an emergency order issued by the code official.

**109.3 Hazard correction order.** Whenever the code official finds that unsafe equipment exists, the code official may issue a hazard correction order specifying the conditions causing the equipment to be unsafe and directing the owner or other person responsible for the unsafe equipment to correct the condition by a date certain. In lieu of correction, the owner may submit a report or analysis to the code official analyzing said conditions and establishing that the equipment is, in fact, safe. The code official may require that the report or analysis be prepared by a licensed engineer.

**109.3.1 Service of hazard correction order.** The order shall be posted on the premises or personally served on the owner of the building or premises or any person responsible for the condition and shall specify the time for compliance.

**109.3.2 Effect of hazard correction order.** It is a violation for any person to fail to comply with a hazard correction order as specified in this subsection.

## SECTION 110

## ADMINISTRATIVE REVIEW

**110.1 Administrative review by the code official.** Applicants may request administrative review by the code official of decisions or actions pertaining to the administration and enforcement of this code. Requests shall be addressed to the code official.

**110.2 Administrative review by the Construction Codes Advisory Board.** Applicants may request review of decisions or actions pertaining to the application and interpretation of this code

by the Construction Codes Advisory Board (CCAB), except for stop work orders, notices of violations and revocations of permits. The review will be performed by three or more members of the Construction Codes Advisory Board, chosen by the Board Chair. The Chair shall consider the subject of the review and members' expertise when selecting members to conduct a review. The decision of the review panel is advisory only; the final decision is made by the code official.

**SECTION 111**

**ENFORCEMENT, VIOLATIONS AND PENALTIES**

**111.1 Violations.** It is a violation of this code for any person to:

1. install, erect, construct, enlarge, alter, repair, replace, remodel, move, improve, remove, convert or demolish, equip, occupy, use or maintain any mechanical system or equipment or cause or permit the same to be done in the City, contrary to or in violation of any of the provisions of this code.

2. use any material or install any device, appliance or equipment that is subject to this code and has not been approved by the code official.

3. knowingly aid, abet, counsel, encourage, hire, induce or otherwise procure another to violate or fail to comply with this code.

4. violate or fail to comply with any final order issued by the code official pursuant to the provisions of this code.

5. remove, mutilate, destroy or conceal any notice or order issued or posted by the code official pursuant to the provisions of this code, or any notice or order issued or posted by the code official in response to a natural disaster or other emergency.

6. conduct work under a permit without requesting an inspection as required by Section 119.

**111.2 Notice of violation.** If, after investigation, the code official determines that standards or requirements of this code have been violated or that orders or requirements have not been complied with, the code official may serve a notice of violation upon the owner, agent, or other person responsible for the action or condition. The notice of violation shall state the standards or requirements violated, shall state what corrective action, if any, is necessary to comply with the standards or requirements, and shall set a reasonable time for compliance.

**111.2.1 Service of notice of violation.** The notice shall be served upon the owner, agent or other responsible person by personal service or regular first class mail addressed to the last known address of such person, or if no address is available after reasonable inquiry, the notice may be posted in a conspicuous place on the premises. The notice may also be posted if served by personal service or first class mail. Nothing in this section limits or precludes any action or proceeding to enforce this code, and nothing obligates or requires the code official to issue a notice of violation prior to the imposition of civil or criminal penalties.

**111.2.2 Review of notice of violation by the code official.**

**111.2.2.1 Request for review.** Any person affected by a notice of violation issued pursuant to Section 111.2 may obtain a review of the notice by making a request in writing within ten days after service of the notice. When the last day of the period computed is a Saturday, Sunday, or City holiday, the period runs until 5 p.m. of the next business day.

**111.2.2.2 Review procedure.** The review shall occur not less than ten nor more than 20 days after the request is received by the code official unless otherwise agreed to by the person

requesting the review. Any person affected by the notice of violation may submit additional information to the code official.

The review shall be made by a representative of the code official who will review any additional information that is submitted and the basis for issuance of the notice of violation. The reviewer may request clarification of the information received and a site visit.

**111.2.2.3 Decision.** After the review, the code official shall:

1. Sustain the notice;

2. Withdraw the notice;

3. Continue the review to a date certain; or

4. Amend the notice.

**111.2.2.4 Order.** The code official shall issue an order containing the decision within 15 days of the date that the review is completed and shall cause the order to be mailed by regular first class mail to the persons requesting the review and the persons named on the notice of violation, addressed to their last known address.

**111.3 Stop work orders.** The code official may issue a stop work order whenever any work is being done contrary to the provisions of this code, or in the event of dangerous or unsafe conditions related to equipment or construction. The stop work order shall identify the violation and may prohibit work or other activity on the site.

**111.3.1 Service of stop work order.** The code official may serve the stop work order by posting it in a conspicuous place at the site, if posting is physically possible. If posting is not physically possible, then the stop work order may be served in the manner set forth in Revised Code of

Washington (RCW) 4.28.080 for service of a summons or by sending it by first class mail to the last known address of: the property owner, the person doing or causing the work to be done, or the holder of a permit if work is being stopped on a permit. For purposes of this section, service is complete at the time of posting or of personal service, or if mailed, three days after the date of mailing. When the last day of the period so computed is a Saturday, Sunday or city holiday, the period runs until 5 p.m. on the next business day.

**111.3.2 Effective date of stop work order.** Stop work orders are effective when posted, or if posting is not physically possible, when one of the persons identified in Section 111.3.1 is served.

**111.3.3 Review of stop work orders by the code official.**

**111.3.3.1 Request for review.** Any person aggrieved by a stop work order may obtain a review of the order by delivering to the code official a request in writing within two business days of the date of service of the stop work order.

**111.3.3.2 Review procedure.** The review shall occur within two business days after receipt by the code official of the request for review unless the requestor agrees to a longer time. Any person affected by the stop work order may submit additional information to the code official for consideration as part of the review at any time prior to the review. The review will be made by a representative of the code official who will review all additional information received and may also request a site visit.

**111.3.3.3 Decision.** After the review, the code official may:

a. Sustain the stop work order;

b. Withdraw the stop work order;

c. Modify the stop work order; or

d. Continue the review to a date certain.

**111.3.3.4 Order.** The code official shall issue an order of the code official containing the decision within two business days after the review and shall cause the order to be sent by first class mail to the person or persons requesting the review, any person on whom the stop work order was served, and any other person who requested a copy before issuance of the order.

**111.4 Authority to disconnect utilities in emergencies.** The code official has the authority to disconnect fuel-gas utility service or energy supplies to a building, structure, premises or equipment regulated by this code in case of emergency where necessary to eliminate an immediate hazard to life or property. The code official may enter any building or premises to disconnect utility service. The code official shall, whenever possible, notify the serving utility, the owner and the occupant of the building, structure or premises of the decision to disconnect prior to taking such action, and shall notify the serving utility, owner and occupant of the building, structure or premises in writing of such disconnection immediately thereafter.

**111.5 Authority to condemn equipment.** Whenever the code official determines that any equipment or portion thereof regulated by this code is hazardous to life, health or property, the code official shall order in writing that such equipment either be disconnected, removed or restored to a safe or sanitary condition, as appropriate. The written notice shall fix a date certain for compliance with such order. It is a violation for any person to use or maintain defective equipment after receiving such notice.

When any equipment or installation is to be disconnected, the code official shall give written notice of such disconnection and causes therefor within 24 hours to the serving utility, the owner and the occupant of the building, structure or premises. When any equipment is maintained in violation of this code, and in violation of a notice issued pursuant to the provisions of this section, the code official shall institute any appropriate action to prevent, restrain, correct or abate the violation.

**111.6 Connection after order to disconnect.** No person shall make connections from any energy, fuel or power supply nor supply energy or fuel to any equipment regulated by this code that has been disconnected or ordered to be disconnected by the code official, or the use of which has been ordered to be discontinued by the code official until the code official authorizes the reconnection and use of such equipment.

**111.7 Civil penalties**. Any person violating or failing to comply with the provisions of this code is subject to a cumulative civil penalty in an amount not to exceed $500 per day for each violation from the date the violation occurs or begins until compliance is achieved. In cases where the code official has issued a notice of violation, the violation will be deemed to begin, for purposes of determining the number of days of violation, on the date compliance is required by the notice of violation.

**111.8 Enforcement in Municipal Court.** Civil actions to enforce this chapter shall be brought exclusively in Seattle Municipal Court, except as otherwise required by law or court rule. In any civil action for a penalty, the City has the burden of proving by a preponderance of the evidence

that a violation exists or existed; the issuance of a notice of violation or of an order following a review by the code official is not itself evidence that a violation exists.

**111.9 Judicial review.** Because civil actions to enforce this code must be brought exclusively in Seattle Municipal Court pursuant to Section 111.8, orders of the code official, including notices of violation issued under this chapter, are not subject to judicial review pursuant to chapter 36.70C RCW.

**111.10 Alternative criminal penalty.** Anyone who violates or fails to comply with any notice of violation or order issued by the code official pursuant to this code or who removes, mutilates, destroys or conceals a notice issued or posted by the code official shall, upon conviction thereof, be punished by a fine of not more than $5000 or by imprisonment for not more than 365 days, or by both such fine and imprisonment for each separate violation. Each day's violation shall constitute a separate offense.

**111.11 Additional relief.** The code official may seek legal or equitable relief to enjoin any acts or practices and abate any condition when necessary to achieve compliance.

## SECTION 112

## RECORDING OF ORDERS AND NOTICES

**112.1 Recording.** The code official may record a copy of any order or notice with the Department of Records and Elections of King County.

## SECTION 113

## RULES OF THE CODE OFFICIAL

**113.1 Authority.** The code official has authority to issue interpretations of this code and to adopt and enforce rules and regulations supplemental to this code as may be deemed necessary to clarify the application of the provisions of this code. Such interpretations, rules and regulations shall be in conformity with the intent and purpose of this code.

**113.2 Procedure for adoption of rules.** The code official shall promulgate, adopt and issue rules according to the procedures specified in the Administrative Code, Chapter 3.02 of the Seattle Municipal Code.

## SECTION 114

## CONSTRUCTION CODES ADVISORY BOARD

**114.1 CCAB committee.** A committee of the Construction Codes Advisory Board may examine proposed administrative rules, appeals and amendments relating to this code and related provisions of other codes and make recommendations to the code official and to the City Council for changes in this code. The committee will be called on as needed by the Construction Codes Advisory Board.

## SECTION 115

## PERMITS

**115.1 Permits required.** Except as otherwise specifically provided in this code, a permit shall be obtained from the code official prior to each installation, alteration, repair, replacement or remodel of any equipment or mechanical system regulated by this code. A separate mechanical permit is required for each separate building or structure.

**115.2 Work exempt from permit.**

**115.2.1 Mechanical.** A mechanical permit is not required for the work listed below.

1. Any portable heating appliance, portable ventilating equipment, or portable cooling unit, if the total capacity of these portable appliances does not exceed 40 percent of the cumulative heating, cooling or ventilating requirements of a building or dwelling unit and does not exceed 3 kW or 10,000 Btu input.

2. Any closed system of steam, hot or chilled water piping within heating or cooling equipment regulated by this code.

3. Minor work or the replacement of any component part of a mechanical system that does not alter its original approval and complies with other applicable requirements of this code.

**115.2.2 Refrigeration.** A mechanical permit is not required for the following refrigerant equipment:

1. Any self-contained refrigerating equipment for which an operating permit is not required.

2. Any self-contained refrigeration system that does not exceed three horsepower rating.

**115.3 Compliance required.** All work shall comply with this code, even where no permit is required.

**115.4 Flood hazard areas.** In addition to the permit required by this section, all work to be performed in areas of special flood hazard as defined in Chapter 25.06 of the Seattle Municipal Code, subject to additional standards and requirements set forth in Chapter 25.06, the Seattle Floodplain Development Ordinance.

**115.5 Emergency repairs.** In the case of an emergency, the installation, alteration or repair of any refrigeration system or equipment may be made without a permit, provided that application

for a permit is made within the later of 24 hours or one working day from the time when the emergency work was started.

## SECTION 116

## APPLICATION FOR PERMIT

**116.1 Application.** To obtain a permit, the applicant shall first file an application in writing on a form furnished by the code official or in another format determined by the code official. Every such application shall:

1. Identify and describe the work to be covered by the permit for which application is made.

2. Describe the land on which the proposed work is to be done by legal description, property address or similar description that will readily identify and definitely locate the proposed building or work.

3. Provide the contractor's business name, address, phone number and current contractor registration number (required if contractor has been selected). To obtain a permit for work on a refrigeration system, the applicant shall also provide the number of the refrigeration contractor license issued by the City.

4. Be accompanied by construction documents, including plans, diagrams, computations and specifications, equipment schedules and other data as required in Sections 116.2 and 116.3.

5. State the valuation of the mechanical work to be done. The valuation of the mechanical work is the estimated current value of all labor and material, whether actually paid for or not, for which the permit is sought.

6. Be signed by the owner of the property or building, or the owner's authorized agent, who may be required to submit evidence to indicate such authority.

7. Give such other data and information as may be required by the code official.

8. Indicate the name of the owner and contractor and the name, address and phone number of a contact person.

**116.2 Construction documents.** Construction documents shall be submitted in one or more sets with each application for a permit, or shall be submitted in electronic format determined by the code official. The code official may require plans, computations and specifications to be prepared and designed by an engineer or architect licensed by the state to practice as such. Projects having a total mechanical valuation of $50,000 or larger shall have a mechanical engineering stamp and signature on each sheet.

**Exception:** A mechanical engineer's stamp or submission of construction documents is not required if the code official finds that the nature of the work applied for is such that review of construction documents is not necessary to obtain compliance with this code.

**116.3 Information on construction documents.**

**116.3.1 Clarity of plans.** Plans shall be drawn to a clearly indicated and commonly accepted scale upon substantial paper such as blueprint quality or standard drafting paper. Tissue paper, posterboard or cardboard will not be accepted. The plans shall be of microfilm quality and limited to a minimum size of 18 inches by 18 inches and a maximum size of 41 inches by 54 inches. Plans and specifications shall be of sufficient clarity to show that the proposed installation will conform to the provisions of this code and to the provisions of all applicable

laws, ordinances, rules, regulations and orders. Plans may be submitted in electronic format as determined by the code official.

**116.3.2 Fire-resistive notes.** The code official may require that plans for buildings more than two stories in height of other than Group R-3 and Group U occupancies indicate how required structural and fire-resistive integrity will be maintained where a penetration will be made for electrical, mechanical, plumbing and communication conduits, pipes and similar systems.

**116.3.3 Information required on plans .** The plans or specifications shall show the following:

1. Layout for each floor with dimensions of all working spaces and a legend of all symbols used.

2. Location, size and material of all piping.

3. Location, size and materials of all air ducts, air inlets and air outlets.

4. Location of all fans, warm-air furnaces, boilers, absorption units, refrigerant compressors and condensers and the weight of all pieces of such equipment weighing 200 pounds or more.

5. Rated capacity or horsepower and efficiency rating of all boilers, warm-air furnaces, heat exchangers, blower fans, refrigerant compressors and absorption units. See also the *Washington State Energy Code with Seattle Amendments*.

6. Location, size and material of all combustion products vents and chimneys.

7. Location and area of all ventilation and combustion air openings and ducts.

8. Location of all air dampers and fire shutters.

9. The first sheet of each set of plans and specifications shall show the address of the proposed work and the name and address of the owner or lessee of the premises.

10. Architectural drawings, typical envelope cross sections and other drawings or data may be required to support system sizing calculations or other thermal requirements of this code or the *Washington State Energy Code with Seattle Amendments*.

## SECTION 117

## APPLICATION REVIEW AND PERMIT ISSUANCE

**117.1 Issuance.**

**117.1.1 General.** The application and, construction documents shall be reviewed by the code official. The construction documents may be reviewed by other departments of the City to check compliance with the laws and ordinances under their jurisdiction.

**117.1.2 Decision and issuance of permit.** If the code official finds that the work as described in an application for a permit and the construction documents substantially conform to the requirements of this code and other pertinent laws and ordinances and that the fees specified in the Fee Subtitle have been paid, the code official shall issue a permit to the applicant. When the permit is issued, the applicant or the applicant's authorized agent becomes the permit holder.

**117.1.3 Compliance with approved plans and permit.** When the code official issues a permit, the code official shall endorse the permit in writing or in electronic format and stamp the plans "APPROVED." Such approved plans and permit shall not be changed, modified or altered without authorization from the code official, and all work shall be done in accordance with the approved construction documents and permit except as the code official may require during field inspection to correct errors or omissions.

**117.2 Amendments to the permit.** When changes to the approved work are made during construction, approval of the code official shall be obtained prior to execution. The building or mechanical inspector may approve minor changes for work not reducing the structural strength or fire and life safety of the structure. The building or mechanical inspector shall determine if it is necessary to revise the approved construction documents. If revised plans are required, changes shall be shown on two sets of plans that shall be submitted to and approved by the code official, accompanied by appropriate fees as specified in the Fee Subtitle prior to occupancy. All changes shall conform to the requirements of this code and other pertinent laws and ordinances and other issued permits.

Minor changes shall not incur additional fees if these changes do not (1) add to the general scope of work; (2) change the basic design concept; (3) involve major relocation of equipment, ducts, or pipes; (4) substantially alter approved equipment size; or (5) require extensive re-review of the plans and specifications.

**117.3 Cancellation of permit applications.** Applications may be cancelled if no permit is issued by the earlier of the following: (1) twelve months following the date of application; or (2) sixty days after the date of written notice that the permit is ready to be issued. After cancellation, construction documents may be returned to the applicant or destroyed by the code official.

The code official shall notify the applicant in writing at least 30 days before the application is cancelled. The notice shall specify a date by which a request for extension must be submitted in order to avoid cancellation. The date shall be at least two weeks prior to the date on which the application will be cancelled.

**117.4 Extensions prior to permit issuance.** At the discretion of the code official, applications for projects that require more than 12 months to review and approve may be extended for a period that provides reasonable time to complete the review and approval, but in no case longer than 24 months from the date of the original application. No application may be extended more than once. After cancellation, the applicant shall submit a new application and pay a new fee to restart the application process.

Notwithstanding other provisions of this code, applications may be extended where issuance of the permit is delayed by litigation, preparation of environmental impact statements, appeals, strikes or other causes related to the application that are beyond the applicant's control, or while the applicant is making progress toward issuance of a master use permit.

**117.5 Retention of plans.** One set of approved plans, which may be on microfilm or in electronic format, shall be retained by the code official. One set of approved plans shall be returned to the applicant and shall be kept at the site of the building or work for use by the inspection personnel at all times when the work authorized is in progress.

**117.6 Validity of permit.** The issuance or granting of a permit or approval of construction documents shall:

1. not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or other pertinent laws and ordinances.

2. not prevent the code official from requiring the correction of errors in the construction documents, or from preventing building operations being carried on thereunder when in violation of this code or of other pertinent laws and ordinances of the City.

3. not prevent the code official from requiring correction of conditions found to be in violation of this code or other pertinent laws and ordinances of the City, or

4. not be construed to extend the period of time for which any such permit is issued or otherwise affect any period of time for compliance specified in any notice or order issued by the code official or other administrative authority requiring the correction of any such conditions.

**117.7 Permit expiration.** Authority to do the work authorized by a permit or a renewed permit expires 18 months from the date of issuance.

**Exceptions:**

1. Initial permits for major construction projects that require more than 18 months to complete, according to a construction schedule submitted by the applicant, may be issued for a period that provides reasonable time to complete the work but in no case longer than three years.

2. The code official may issue permits that expire in less than 18 months if the code official determines a shorter period is appropriate to complete the work.

**117.8 Renewal of permits.** Permits may be renewed and renewed permits may be further renewed by the code official, if the following conditions are met:

1. Application for renewal is made within the 30 day period immediately preceding the date of expiration of the permit;

2. If the project has had an associated discretionary Land Use review, and the land use approval has not expired per Seattle Municipal Code 23.76. 032; and

3. If an application for renewal is made either more than 18 months after the date of mandatory compliance with a new or revised edition of this code or after the effective date of an amendment to applicable provisions of the Land Use Code, the permit shall not be renewed unless:

3.1 The code official determines that the permit complies, or is modified to comply with the code or codes in effect on the date of application renewal; or

3.2 The work authorized by the permit is substantially underway and progressing at a rate approved by the code official. "Substantially underway" means that work such as excavation, inspections, and installation of framing, electrical, mechanical and finish work is being completed on a continuing basis; and

4. Commencement or completion of the work authorized by the permit is delayed by litigation, appeals, strikes or other causes related to the work authorized by the permit, beyond the permit holder's control if application for renewal is made within the 30 day period immediately preceding the date of expiration of the permit.

**117.9 Reestablishment.** A new permit is required to complete work if a permit has expired and was not renewed.

**Exception:** A permit that expired less than one year prior to the date of a request for reestablishment may be reestablished upon approval of the code official if it complies with Items 2 and 3 or Item 4 of Section 117.8.

**117.10 Revocation of mechanical permits.**

**117.10.1**. **Notice of revocation.** Whenever the code official determines there are grounds for revoking a permit, the code official may issue a notice of revocation. The notice of revocation

shall identify the reason for the proposed revocation, including the violations, the conditions violated, and any alleged false or misleading information provided.

**117.10.2 Standards for revocation.** The code official may revoke a permit if:

1. The code or the permit has been or is being violated and issuance of a notice of violation or stop work order has been or would be ineffective to secure compliance because of circumstances related to the violation; or

2. The permit was obtained with false or misleading information.

**117.10.3 Service of notice of revocation.** The notice of revocation shall be served on the owner of the property on which the work is occurring, the holder of a permit if different than the owner, and the person doing or causing the work to be done. The notice of revocation shall be served in the manner set forth in RCW 4.28.080 for service of a summons or sent by first class mail to the last known address of the responsible party. For purposes of this section, service is complete at the time of personal service, or if mailed, three days after the date of mailing. When the last day of the period so computed is a Saturday, Sunday or city holiday, the period runs until 5 p.m. on the next business day.

**117.10.4 Effective date of revocation.** The code official shall identify in the notice of revocation a date certain on which the revocation will take effect. This date may be stayed pending complete review by the code official pursuant to Section 117.10.5.

**117.10.5 Review by the code official for notice of revocation.**

**117.10.5.1 Request for review.** Any person aggrieved by a notice of revocation may obtain a review by making a request in writing to the code official within three business days of the date

of service of the notice of revocation. The review shall occur within five business days after receipt by the code official of the request for review. Any person affected by the notice of revocation may submit additional information to the code official for consideration as part of the review at any time prior to the review.

**117.10.5.2 Conduct of review.** The review will be made by a representative of the code official who will review all additional information received and may also request a site visit. After the review, the code official may:

1. Sustain the notice of revocation and affirm or modify the date the revocation will take effect;

2. Withdraw the notice of revocation;

3. Modify the notice of revocation and affirm or modify the date the revocation will take effect; or

4. Continue the review to a date certain.

**117.10.5.3 Order of revocation of permit.** The code official shall issue an order of the code official containing the decision within ten days after the review and shall cause the same to be sent by first class mail to the person or persons requesting the review, any other person on whom the notice of revocation was served, and any other person who requested a copy before issuance of the order.

## SECTION 118

## FEES

**118.1 Fees.** A fee for each mechanical permit and for other activities related to the enforcement of this code shall be paid as set forth in the Fee Subtitle.

## SECTION 119

## INSPECTIONS

**119.1 General.** All construction or work for which a permit is required is subject to inspection by the code official, and certain types of construction shall have special inspections by registered special inspectors specified in Chapter 17 of the *International Building Code*.

**119.2 Inspection requests.** The owner of the property or the owner's authorized agent, or the person designated by the owner/agent to do the work authorized by a permit shall notify the code official that work requiring inspection as specified in this section and Section 120 is ready for inspection.

**119.3 Access for inspection.** The permit holder and the person requesting any inspections required by this code shall provide access to and means for proper inspection of such work, including safety equipment required by the Washington Industrial Safety and Health Agency. The work shall remain accessible and exposed for inspection purposes until approved by the code official. Neither the code official nor the City shall be liable for expense entailed in the required removal or replacement of any material to allow inspection.

**119.4 Inspection record.** Work requiring a mechanical permit shall not be commenced until the permit holder or the permit holder's agent has posted an inspection record in a conspicuous place on the premises and in a position that allows the code official to conveniently make the required entries regarding inspection of the work. This record shall be maintained in such a position by the permit holder or the permit holder's agent until final approval has been granted by the code official.

**119.5 Approvals required.** No work shall be done on any part of the building or structure beyond the point indicated in each successive inspection without first obtaining the written approval of the code official. Written approval shall be given only after an inspection has been made of each successive step in the construction as indicated by each of the inspections required in this code.

**119.5.1 Effect of approval.** Approval as a result of an inspection is not approval of any violation of the provisions of this code or of other pertinent laws and ordinances of the City. Inspections presuming to give authority to violate or cancel the provisions of this code or of other pertinent laws and ordinances of the City are not valid.

**119.6 Final inspection.** When the installation of a mechanical system is complete, an additional and final inspection shall be made.

**119.7 Operation of mechanical equipment.** The requirements of this section do not prohibit the operation of any mechanical systems installed to replace existing equipment or fixtures serving an occupied portion of the building in the event a request for inspection of such equipment or fixture has been filed with the code official not more than 48 hours after such replacement work is completed, and before any portion of such mechanical system is concealed by any permanent portion of the building.

**119.8 Testing of equipment and systems.** Refrigeration equipment regulated by this code shall be tested and approved as required by Chapter 11 of this code. Fuel-oil piping shall be tested and approved as required by Chapter 13 of this code.

**119.9 Other inspections.** In addition to the "called" inspections specified above, the code official may make or require any other inspections of any mechanical work to ascertain compliance with the provisions of this code and other laws and ordinances that are enforced by the code official.

**119.10 Special investigation.** If work for which a permit or approval is required is commenced or performed prior to making formal application and receiving the code official's permission to proceed, the code official may make a special investigation inspection before a permit is issued for the work. If a special investigation is made, a special investigation fee may be assessed in accordance with the Fee Subtitle.

**119.11 Reinspections.** The code official may require a reinspection if work for which inspection is called is not complete, corrections required are not made, the inspection record is not properly posted on the work site, the approved plans are not readily available to the inspector, access is not provided on the date for which inspection is requested, if deviations from construction documents that require the approval of the code official have been made without proper approval, or as otherwise required by the code official.

**119.11.1 Compliance with Section 104.4.** For the purpose of determining compliance with Section 104.4, Maintenance, the code official or the fire chief may cause any structure or system to be reinspected.

**119.11.2 Reinspection fee.** The code official may assess a reinspection fee as set forth in the Fee Subtitle for any action for which reinspection is required. In instances where reinspection fees

have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

## SECTION 120

## CONNECTION APPROVAL

**120.1 Energy connections.** No person shall make connections from a source of energy fuel to a mechanical system or equipment regulated by this code for which a permit is required until approved by the code official.

**120.2 Temporary connections.** The code official may authorize temporary connection of the mechanical equipment to the source of energy fuel for the purpose of testing the equipment, or for use under a temporary certificate of occupancy.

## SECTION 121

## REFRIGERATION LICENSES

**121.1 Refrigeration licenses.** No person shall perform any of the services or activities related to refrigeration systems regulated by Chapter 11 without a license required by Chapter 6.82 of the Seattle Municipal Code, or under the direct supervision of a person holding a required license.

## SECTION 122

## OPERATING PERMITS FOR REFRIGERATION SYSTEMS

**122.1** An operating permit issued by the code official is required to operate any refrigeration system meeting any one of the following criteria:

1. Any system over 50 horsepower, or

2. Any system over 50 tons of refrigerant effect, or

3. Any system that contains over 150 pounds of refrigerant, or

4. Any system that includes a refrigerant containing a pressure vessel over six inches in diameter with a capacity of more than 5 cubic feet and a design working pressure under 250 psig, or

5. Any system that includes a refrigerant containing a pressure vessel over six inches in diameter having a capacity of one and one-half cubic feet and a design working pressure over 250 psig.

**122.2** The operating permit will not be issued until the system has been inspected and approved by the code official as safe to operate and in compliance with the provisions of this code. The permit is valid for a period of one year, renewable annually. The permit shall be displayed in a conspicuous place adjacent to the refrigeration system.

Section 3. The following sections of Chapter 2 of the International Mechanical Code, 2009 Edition, are amended as follows:

**CHAPTER 2**

**DEFINITIONS**

**SECTION 201**

**GENERAL**

**201.1 Scope.** Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings indicated in this chapter.

**201.2 Interchangeability.** Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

**201.3 Terms defined in other codes.** Where terms are not defined in this code and are defined in the *International Building Code*, *Seattle Electrical Code*, *International Fire Code*, *International Fuel Gas Code* or the ((~~*International*~~)) *Uniform Plumbing Code*, such terms shall have meanings ascribed to them as in those codes.

**201.4 Terms not defined.** Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

**SECTION 202**

**GENERAL DEFINITIONS**

*******

((~~**AUTOMATIC BOILER.** Any class of boiler that is equipped with the controls and limit devices specified in Chapter 10.~~))

*******

**BOILER.** A closed heating *appliance* intended to supply hot water or steam for space heating, processing or power purposes. ((~~Low-pressure boilers operate at pressures less than or equal to 15 pounds per square inch (psi) (103 kPa) for steam and 160 psi (1103 kPa) for water. High-pressure boilers operate at pressures exceeding those pressures.~~))

**BOILER CODE.** The *Seattle Boiler and Pressure Vessel Code.*

*******

**CODE.** These regulations, subsequent amendments thereto, or any emergency rule or regulation that ((~~the administrative authority having jurisdiction~~)) has been lawfully adopted.

**CODE OFFICIAL. ((**~~The officer or other designated authority charged with the administration and enforcement of this code,~~)) Director of the Department of Planning and Development or a duly authorized representative.

***

**CONDITIONED SPACE. ((**~~An area, room or space being heated or cooled by any *equipment* or *appliance*.~~)) A cooled space, heated space (fully heated), heated space (semi-heated), or indirectly conditioned space.

**CONFINED SPACE.** A space having a volume less than 50 cubic feet per 1,000 British thermal units per hour (Btu/h) (4.8 $m^3$/kW) of the aggregate input rating of all appliances installed in that space.

***

**CONTAINER (REFRIGERANT).** A cylinder for the transportation of refrigerant.

***

**CRITICAL PRESSURE, CRITICAL TEMPERATURE, AND CRITICAL VOLUME.** Terms given to the state points of a substance at which liquid and vapor have identical properties. Above the critical pressure or critical temperature there is no line of demarcation between liquid and gaseous phases.

**DAMPER.** A manually or automatically controlled device to regulate draft or the rate of flow of air or *combustion* gases.

**Backdraft damper.** A damper installed to restrict introduction of unconditioned air from an unconditioned space to a conditioned space.

**Barometric damper.** Any listed device that freely allows the flow of air in one direction, but does not allow conditioned air to escape. All installed combustion air dampers shall meet the installation requirements of the manufacturer.

**Chimney Damper.** A movable valve or plate within the chimney connector for controlling the draft or flow of combustion gases.

**Fire damper.** See "fire damper".

**Smoke damper.** See "smoke damper".

**Volume damper.** A device that, when installed, will restrict, retard or direct the flow of air in a duct, or the products of *combustion* in a heat-producing *appliance*, its vent connector, vent or *chimney* therefrom.

***

**DIRECT REFRIGERATION SYSTEM.** A system in which the evaporator or condenser of the refrigerating system is in direct contact with the air or other substances to be cooled or heated. See Figure 2-1.

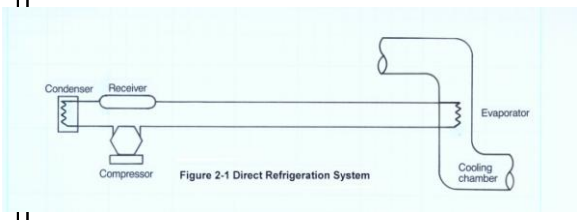

Figure 2-1 Direct Refrigeration System

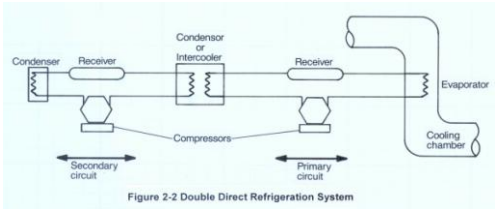

Figure 2-2 Double Direct Refrigeration System

**Double direct refrigeration system.** A system in which an evaporative refrigerant is used in a secondary circuit to condense or cool a refrigerant in a primary circuit. For the purpose of this

code, each system enclosing a separate body of an evaporative refrigerant is considered a separate direct system. See Figure 2-2.

***

**ENERGY CODE.** The *Washington State Energy Code with Seattle Amendments.*

***

**ENVIRONMENTAL AIR.** Air that is, at temperatures not exceeding $250^0$F ($121^0$C), conveyed to or from occupied areas through ducts which are not part of the heating or air-conditioning system, such as ventilation for human usage, relief air, domestic kitchen range exhaust, bathroom exhaust, ((~~and~~)) domestic clothes dryer exhaust, parking garage exhaust, transformer vault exhaust, and elevator exhaust.

***

**[F] GAS ROOM.** A separately ventilated, fully enclosed room in which only compressed gases and associated equipment and supplies are stored or used.

***

**[B] HIGH-RISE BUILDING.** A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

***

**HOOD.** An air intake device used to capture by entrapment, impingement, adhesion or similar means, grease, moisture, heat and similar contaminants before they enter a duct system.

**Type I.** A kitchen hood for collecting and removing grease vapors and smoke generated from medium-duty, heavy-duty, extra-heavy-duty, and some light-duty cooking appliances. Such hoods are equipped with a fire suppression system.

**Type II.** A general kitchen hood for collecting and removing steam, vapor, heat, odors and products of *combustion* generated from some light-duty cooking appliances.

***

**INDIRECT REFRIGERATION SYSTEM.** A system in which a secondary coolant cooled or heated by the refrigerating system is circulated to the air or other substance to be cooled or heated. See Figure 2-3. Indirect systems are distinguished by the method of application shown below:

**Closed system.** A system in which a secondary fluid is either cooled or heated by the refrigerating system and then circulated within a closed circuit in indirect contact with the air or other substance to be cooled or heated.

**Double-indirect open-spray system.** A system in which the secondary substance for an indirect open-spray system is heated or cooled by an intermediate coolant circulated from a second enclosure.

**Open-spray system.** A system in which a secondary coolant is cooled or heated by the refrigerating system and then circulated in direct contact with the air or other substance to be cooled or heated.

**Vented closed system.** A system in which a secondary coolant is cooled or heated by the refrigerating system and then passed through a closed circuit in the air or other substance to be

cooled or heated, except that the evaporator or condenser is placed in an open or appropriately vented tank.

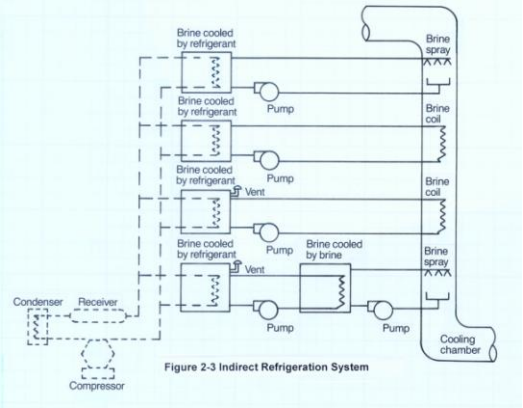

Figure 2-3 Indirect Refrigeration System

***

**LIGHT-DUTY COOKING APPLIANCE.** Light-duty cooking *appliances* include gas and electric ovens of a maximum 6 kW or 20,000 Btu/h capacity (including standard, bake, roasting, revolving, retherm, convection, combination convection/steamer, countertop conveyorized baking/finishing, deck and pastry), electric and gas steam-jacketed kettles, electric and gas pasta cookers, electric and gas compartment steamers (both pressure and atmospheric) and electric and gas cheesemelters.

***

**MEDIUM-DUTY COOKING APPLIANCE.** Medium-duty cooking *appliances* include electric discrete element ranges (with or without oven), electric and gas hot-top ranges, electric and gas griddles, electric and gas double-sided griddles, electric and gas fryers (including open

deep fat fryers, donut fryers, kettle fryers and pressure fryers), ((~~electric and gas conveyor pizza ovens,~~)) electric and gas tilting skillets (braising pans) and electric and gas rotisseries.

***

**PERSON.** Any individual, receiver, administrator, executor, assignee, trustee in bankruptcy, trust, estate, firm, partnership, joint venture, club, company, joint stock company, business trust, municipal corporation, political subdivision of the State of Washington, corporation, limited liability company, association, society or any group of individuals acting as a unit, whether mutual, cooperative, fraternal, nonprofit or otherwise, and the United States or any instrumentality thereof.

***

**((~~POWER BOILER.~~** ~~See "Boiler.")~~)

***

**((~~PRESSURE VESSELS.~~** ~~Closed containers, tanks or vessels that are designed to contain liquids or gases, or both, under pressure.)~~)

***

**PRODUCT-CONVEYING AIR.** Air used for conveying solid particulates, such as refuse, dust, fumes and smoke; liquid particulate matter, such as spray residue, mists and fogs; vapors, such as vapors from flammable or corrosive liquids; noxious and toxic gases; and air at temperatures exceeding 250°F (121°C). Examples of product-conveying air include, but are not limited to, those that serve a combustion engine, industrial vacuum system, chemical booth, paint booth, paint enclosure and photo lab exhaust.

***

**RELIEF AIR.** Exhausted return air from a system that provides ventilation for human usage.

***

**SATURATION PRESSURE.** The pressure at which there is a stable coexistence of the vapor and liquid or the vapor and solid phases of a refrigerant.

***

**SLEEVE.** A factory-built chimney fitting designed to protect combustible materials when it is necessary to penetrate a combustible wall to connect a chimney.

***

**[W] SOURCE SPECIFIC VENTILATION.** A mechanical ventilation system including all fans, controls, and ducting, which is dedicated to exhausting contaminant-laden air to the exterior of the building from the room or space in which the contaminant is generated.

***

((~~**STEAM HEATING BOILER.** A boiler operated at pressures not exceeding 15 psi (103 kPa) for steam.~~))

***

**THIMBLE.** A listed fitting designed to be installed in the opening in a masonry chimney through which the chimney connector passes.

***

**UNCONFINED SPACE.** A space having a volume not less than 50 cubic feet per 1,000 Btu/h (4.8$m^3$/kW) of the aggregate input rating of all fuel-burning appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

***

**UNSAFE.** Constituting a fire or health hazard or otherwise dangerous to human life, constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, disaster, damage or abandonment.

**[W] UNUSUALLY TIGHT CONSTRUCTION.** Construction meeting the following requirements:

1. Walls exposed to the outdoor atmosphere having a continuous water vapor retarder with a rating of 1 perm [57 ng/(s• $m^2$ • Pa)] or less with openings gasketed or sealed; and

2. Operable windows and doors meeting the air leakage requirements of the *Washington State Energy Code with Seattle Amendments*, Section 502.1.4; and

3. Caulking or sealants are applied to areas such as joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical and gas lines, and at other openings; ((-)) or

4. Buildings built in compliance with the 1986 or later editions of the *Washington State Energy Code*, WAC 51-11; *Northwest Energy Code*; or Super Good Cents weatherization standards or equivalent.

**Interpretation:** 1986 and later editions of the *Washington State Energy Code with Seattle Amendments*, and Seattle City Light's Built Smart program are considered equivalent standards for unusually tight construction.

***

**WATER HEATER.** Any heating *appliance* or *equipment*, not exceeding a pressure of 160 psi (1103 kPa), a volume of 120 gallons and a heat input of 200,000 Btu/hr, that heats potable water and supplies such water to the potable hot water distribution system.

**[W] WHOLE HOUSE VENTILATION SYSTEM.** A mechanical ventilation system, including fans, controls, and ducts, which replaces, by direct or indirect means, air from the habitable rooms with outdoor air.

***

Section 4. The following sections of Chapter 3 of the International Mechanical Code, 2009 Edition, are amended as follows:

**CHAPTER 3**

**GENERAL REGULATIONS**

**SECTION 301**

**GENERAL**

**301.1 Scope.** This chapter shall govern the approval and installation of all *equipment* and appliances that comprise parts of the building mechanical systems regulated by this code in accordance with Section 103.1 ((~~101.2~~)).

**301.2 Energy utilization.** Heating, ventilating and air-conditioning systems of all structures shall be designed and installed for efficient utilization of energy in accordance with the ((~~*International Energy Conservation Code*~~)) *Washington State Energy Code with Seattle Amendments*.

*******

**301.4 Listed and labeled.** Appliances regulated by this code shall be *listed* and *labeled* for the application in which they are installed and used, unless otherwise *approved* in accordance with Sections 105, 106 or 107.

**Exception:** Listing and labeling of *equipment* and appliances used for refrigeration shall be in accordance with Section 1101.2.

*******

**301.7 Electrical.** Electrical wiring, controls and connections to *equipment* and appliances regulated by this code shall be in accordance with ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**301.8 Plumbing connections.** Potable water supply and building drainage system connections to *equipment* and appliances regulated by this code shall be in accordance with the ((~~*International*~~)) *Uniform Plumbing Code*.

*******

## SECTION 303

## EQUIPMENT AND APPLIANCE LOCATION

*******

**303.3 Prohibited locations.** Fuel-fired appliances shall not be located in, or obtain *combustion* air from, any of the following rooms or spaces:

1. Sleeping rooms.

2. Bathrooms.

3. Toilet rooms.

4. Storage closets.

5. Surgical rooms.

**Exception:** This section shall not apply to the following appliances:

1. *Direct-vent appliances* that obtain all *combustion air* directly from the outdoors.

2. Solid fuel-fired appliances, provided that the room is not a *confined space* and the building is not of unusually tight construction.

3. Appliances installed in a dedicated enclosure in which all *combustion* air is taken directly from the outdoors, in accordance with Chapter 7. *Access to* such enclosure shall be through a solid door, weather-stripped in accordance with the exterior door air leakage requirements of the ((~~*International Energy Conservation Code*~~)) *Washington State Energy Code with Seattle Amendments* and equipped with an *approved* self-closing device.

***

**303.7 Pit locations.** Appliances installed in pits or excavations shall not come in direct contact with the surrounding soil. The sides of the pit or excavation shall be held back a minimum of 12 inches (305 mm) from the *appliance*, and a minimum of 30 inches (762 mm) on the control side. Where the depth exceeds 12 inches (305 mm) below adjoining grade, the walls of the pit or

excavation shall be lined with concrete or masonry. Such concrete or masonry shall extend a minimum of 4 inches (102 mm) above adjoining grade and shall have sufficient lateral load-bearing capacity to resist collapse. The *appliance* shall be protected from flooding in an *approved* manner.

**[B] 303.8 ((~~Elevator shafts.~~** ~~Mechanical systems shall not be located in an elevator shaft.~~))

**Installation of pipes or ducts conveying gases, vapors or liquids in hoistways, machine rooms, or machinery spaces.** Pipes and ducts conveying gases, vapors or liquids shall not be installed in hoistways, machine rooms, and machinery spaces.

**Exceptions:**

1. Only ducts for heating, cooling, ventilating, and venting these spaces are permitted to be installed in the hoistway, machine room, and machinery space.

2. Ducts and electrical conduit may pass through an elevator machine room or machinery space if they are separated from the room or space by construction equal to the rated construction of the room or space and located so that all required clearances are maintained. If a vented machine room is not vented directly to the outside of the building, the vent shall be enclosed within a fire barrier with at least a one-hour fire-resistance rating, or as required for a shaft where it passes through occupied floors.

3. Standard sprinkler protection conforming to the requirements of NFPA 13 shall be permitted to be installed in these spaces, subject to rules promulgated by the code official.

4. Subject to the approval of the code official, pipes protected with double containment and pipes with threaded or welded joints are permitted. Pipes shall not be located less than 7 feet above the floor in machine rooms.

**[B] 303.9 Exit Enclosures.** Mechanical systems shall not be located in exit enclosures. Penetrations passing entirely through both protective membranes are prohibited.

**Exceptions:**

1. Equipment allowed or required by the *International Building Code* to serve the exit enclosure such as:

1.1 ductwork and equipment necessary for independent stairway pressurization,

1.2 sprinkler piping,

1.3 standpipes,

1.4 electrical conduit terminating in a listed box not exceeding 16 square inches (10 323 $mm^2$) in area, and

1.5 piping used exclusively for the drainage of rainfall runoff from roof areas provided the roof is not used for a helistop or heliport.

2. Unfired heaters allowed by the *International Building Code* for freeze protection of fire protection equipment may penetrate one protective membrane. The conduit serving the heater may penetrate both protective membranes.

Penetrations shall be protected as required by the *International Building Code*. Penetrations and openings communicating between exit enclosures in the same building are not permitted regardless of their protection.

## SECTION 304

## INSTALLATION

***

**304.3 Elevation of ignition source.** Equipment and appliances having an *ignition source* and located in hazardous locations and public garages, private garages, repair garages, automotive motor fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the *equipment* or *appliance* rests. For the purpose of this section, rooms or spaces that are not part of the living space of a *dwelling unit* and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

**304.3.1 Parking garages.** Connection of a parking garage with any room in which there is a fuel-fired *appliance* shall be by means of a vestibule providing a two-doorway separation, except that a single door is permitted where the sources of ignition in the *appliance* are elevated in accordance with Section 304.3.

**Exception:** This section shall not apply to *appliance* installations complying with Section 304.6 or to equipment having an internal combustion engine.

***

**304.11 Clearances and encroachments in the public right of way.** All encroachments of equipment and appliances on, over or under sidewalks, streets, alleys and other public property are subject to approval by the Director of Transportation and the code official. Encroachments

shall comply with this code and other codes as determined by the Director of Transportation and the code official.

**Note:** The Department of Transportation publishes the "Seattle Right-of-Way Improvements Manual" that contains detailed information on clearances, encroachments and required SDOT street use permits. The Department of Transportation discourages encroachments into the public right-of-way by mechanical equipment.

**[B] 304.12 ((~~304.11~~)) Guards.** Guards shall be provided where appliances, *equipment*, fans or other components that require service and roof hatch openings are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall extend not less than 30 inches (762 mm) beyond each end of such appliances, *equipment*, fans, components and roof hatch openings and the top of the guard shall be located not less than 42 inches (1067 mm) above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the *International Building Code.*

**304.13 ((~~304.12~~)) Area served.** Appliances serving different areas of a building other than where they are installed shall be permanently marked in an *approved* manner that uniquely identifies the *appliance* and the area it serves.

*******

**SECTION 306**

**ACCESS AND SERVICE SPACE**

***

**306.3 Appliances in attics.** Attics containing appliances shall be provided with an opening and unobstructed passageway large enough to allow removal of the largest *appliance*. The passageway shall not be less than 30 inches (762 mm) high and 22 inches (559 mm) wide and not more than 20 feet (6096 mm) in length measured along the centerline of the passageway from the opening to the *appliance*. The passageway shall have continuous solid flooring not less than 24 inches (610 mm) wide. A level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the *appliance*. The clear access opening dimensions shall be a minimum of 20 inches by 30 inches (508 mm by 762 mm), and large enough to allow removal of the largest *appliance*.

**Exceptions:**

1. The passageway and level service space are not required where the *appliance* is capable of being serviced and removed through the required opening.

2. Where the passageway is unobstructed and not less than 6 feet (1829 mm) high and 22 inches (559 mm) wide for its entire length, the passageway shall be not greater than 50 feet (15 250 mm) in length.

**306.3.1 Electrical requirements.** A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be provided at or near the *appliance* location in accordance with ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**306.4 Appliances under floors.** Underfloor spaces containing appliances shall be provided with an access opening and unobstructed passageway large enough to remove the largest *appliance*.

The passageway shall not be less than 30 inches (762 mm) high and 22 inches (559 mm) wide, nor more than 20 feet (6096 mm) in length measured along the centerline of the passageway from the opening to the *appliance*. A level service space not less than 30 inches (762 mm)deep and 30 inches (762 mm) wide shall be present at the front or service side of the *appliance*. If the depth of the passageway or the service space exceeds 12 inches (305 mm) below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry. Such concrete or masonry shall extend a minimum of 4 inches (102 mm) above the adjoining grade and shall have sufficient lateral-bearing capacity to resist collapse. The clear access opening dimensions shall be a minimum of 22 inches by 30 inches (559 mm by 762 mm), and large enough to allow removal of the largest *appliance*.

**Exceptions:**

1. The passageway is not required where the level service space is present when the access is open and the *appliance* is capable of being serviced and removed through the required opening.

2. Where the passageway is unobstructed and not less than 6 feet high (1929 mm) and 22 inches (559 mm) wide for its entire length, the passageway shall not be limited in length.

**306.4.1 Electrical requirements.** A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be provided at or near the *appliance* location in accordance with ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**306.5 Equipment and appliances on roofs or elevated structures.** Where *equipment* and *appliances* requiring access ((~~and appliances~~)) are installed on roofs or elevated structures at a

height exceeding 16 feet (4877 mm), such access shall be provided by a permanent *approved* means of access, the extent of which shall be from grade or floor level to the *equipment* and appliances' level service space. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) high or walking on roofs having a slope greater than four units vertical in 12 units horizontal (33-percent slope). Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall. Permanent ladders installed to provide the required access shall comply with the following minimum design criteria:

1. The side railing shall extend above the parapet or roof edge not less than ((~~30~~)) 42 inches (((~~762~~)) 1067 mm).

2. Ladders shall have rung spacing not to exceed ((~~14~~)) 12 inches (((~~356~~)) 305 mm) on center.

3. Ladders shall have a toe spacing not less than ((~~6~~)) 7 inches (((~~152~~)) 178 mm) deep.

4. There shall be a minimum of 18 inches (457 mm) between rails.

5. Rungs shall have a minimum 0.75-inch (19 mm) diameter and be capable of withstanding a 300-pound (136.1 kg) load.

6. Ladders over 30 feet (9144 mm) in height shall be provided with offset sections and landings capable of withstanding 100 pounds per square foot (488.2 kg/m$^2$). Landing dimensions shall be not less than 18 inches (457 mm) and not less than the width of the ladder served. A guard rail shall be provided on all open sides of the landing.

7. Ladders shall be protected against corrosion by *approved* means.

Catwalks installed to provide the required access shall be not less than 24 inches (610 mm) wide and shall have railings as required for service platforms.

**Exception:** This section shall not apply to Group R-3 occupancies.

**306.5.1 Sloped roofs.** Where appliances, *equipment*, fans or other components that require service are installed on a roof having a slope of three units vertical in 12 units horizontal (25-percent slope) or greater and having an edge more than 30 inches (762 mm) above grade at such edge, a level platform shall be provided on each side of the *appliance* or *equipment* to which access is required for service, repair or maintenance. The platform shall be not less than 30 inches (762 mm) in any dimension and shall be provided with guards. The guards shall extend not less than 42 inches (1067 mm) above the platform, shall be constructed so as to prevent the passage of a 21-inch diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the *International Building Code*. Access shall not require walking on roofs having a slope greater than four units vertical in 12 units horizontal (33-percent slope). Where access involves obstructions greater than 30 inches (762 mm) in height, such obstructions shall be provided with ladders installed in accordance with Section 306.5 or stairs installed in accordance with the requirements specified in the *International Building Code* in the path of travel to and from appliances, fans or *equipment* requiring service.

**306.5.2 Electrical requirements.** A receptacle outlet shall be provided at or near the *equipment* location in accordance with ((~~NFPA 70~~)) the *Seattle Electrical Code*.

## SECTION 307

## CONDENSATE DISPOSAL

***

**307.2 Evaporators and cooling coils.** Condensate drain systems shall be provided for *equipment* and appliances containing evaporators or cooling coils. Condensate drain systems shall be designed, constructed and installed in accordance with Sections 307.2.1 through 307.2.4.

**307.2.1 Condensate disposal.** Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an *approved* place of disposal. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope). Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

**307.2.2 Drain pipe materials and sizes.** Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 of the ((~~*International*~~)) *Uniform Plumbing Code* relative to the material type. Condensate waste and drain line size shall be not less than 3/4-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with Table 307.2.2.

**307.2.3 Auxiliary and secondary drain systems.** In addition to the requirements of Section 307.2.1, where damage to any building components could occur as a result of overflow from the *equipment* primary condensate removal system, one of the following auxiliary protection methods shall be provided for each cooling coil or fuel-fired *appliance* that produces condensate:

1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of 11/2 inches (38 mm), shall not be less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Galvanized sheet steel pans shall have a minimum thickness of not less than 0.0236 inch (0.6010 mm) (No. 24 gage). Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).

2. A separate overflow drain line shall be connected to the drain pan provided with the *equipment*. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.

3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water-level detection device conforming to UL 508 that will shut off the *equipment* served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.

4. A water-level detection device conforming to UL 508 shall be provided that will shut off the *equipment* served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line, or in the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.

**Exception:** Fuel-fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.

**307.2.3.1 Water-level monitoring devices.** On downflow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the *equipment* served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.

**307.2.3.2 Appliance, equipment and insulation in pans.** Where appliances, *equipment* or insulation are subject to water damage when auxiliary drain pans fill, that portion of the *appliance, equipment* and insulation shall be installed above the rim of the pan. Supports located inside of the pan to support the *appliance* or *equipment* shall be water resistant and *approved*.

**307.2.4 Traps.** Condensate drains shall be trapped as required by the *equipment* or *appliance* manufacturer.

*******

**[B] SECTION 309**

**TEMPERATURE CONTROL**

**[B] 309.1 Space-heating systems.** Interior spaces intended for human occupancy shall be provided with active or passive space-heating systems capable of maintaining an average ((~~a minimum~~)) indoor temperature of 68°F (20°C) at a point 3 feet (914 mm) above floor ((~~on the design heating day~~)) when the outside temperature is 24°F. The installation of portable space heaters shall not be used to achieve compliance with this section.

**Exception:** Interior spaces where the primary purpose is not associated with human comfort.

***

**SECTION 312**

**HEATING AND COOLING LOAD CALCULATIONS**

**312.1 Load calculations.** Heating and cooling system design loads for the purpose of sizing systems, appliances and *equipment* shall be determined in accordance with the procedures described in the ((~~ASHRAE/ACCA Standard 183~~)) *Washington State Energy Code with Seattle Amendments*. ((~~Alternatively, design loads shall be determined by an *approved* equivalent computation procedure, using the design parameters specified in Chapter 3 of the *International Energy Conservation Code*.~~))

Section 5. The following sections of Chapter 4 of the International Mechanical Code, 2009 Edition, are amended as follows:

**CHAPTER 4**

**VENTILATION**

**SECTION 401**

**GENERAL**

***

**401.2 Ventilation required.** Every occupied space other than enclosed parking garages, loading docks and motor vehicle repair garages shall be ventilated in accordance with Section 401.2.1 or 401.2.2. Enclosed parking garages, loading docks and motor vehicle repair garages shall be ventilated by mechanical means in accordance with Sections 403 and 404.

**[W] 401.2.1 Group R occupancies.** Ventilation in Group R occupancies shall be provided in accordance with the Sections 403.8 and 403.9.

**401.2.2 All other occupancies.** Ventilation in all other occupancies shall be provided by natural means in accordance with Section 402 or by mechanical means in accordance with Sections 403.1 through 403.7 and 403.9.

***

**401.4 Intake opening location.** Air intake openings shall comply with all of the following:

1. Intake openings shall be located a minimum of 10 feet (3048 mm) from lot lines or buildings on the same lot. Where openings front on a street or public way, the distance shall be measured to the ((~~centerline~~)) opposite side of the street or public way.

2. Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as vents, streets, alleys, parking lots and loading docks, except as specified in Item 3 or Section 501.2.1. The exhaust from a bathroom, clothes dryer or kitchen in a residential dwelling shall not be considered to be a hazardous or noxious contaminant.

3. Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening.

4. Intake openings on structures in flood hazard areas shall be at or above the design flood level.

5. Intake openings shall not be located:

5.1. In a crawl space;

5.2. Less than one foot (305 mm) above a roof, adjacent grade, or other surface directly below the intake; or

5.3. Under a deck having a surface height less than three feet above grade or other surface directly below the intake.

**Interpretation:** For purposes of this section, lot line includes any property line separating one lot from another lot, but does not include any property line separating a lot from a public street or alley right-of-way.

***

**401.7 Compliance and commissioning.** Compliance with Section 403.9 shall be demonstrated through engineering calculations. Documentation of calculations shall be submitted on the permit plan sets.

Testing and commissioning shall be performed and documented in accordance with Section 1416 of the *Washington State Energy Code with Seattle Amendments*.

***

**SECTION 402**

**NATURAL VENTILATION**

**[B] 402.1 Natural ventilation.** *Natural ventilation* of an occupied space shall be through windows, doors, louvers or other openings to the outdoors. The operating mechanism for such openings shall be provided with ready access so that the openings are readily controllable by the building occupants.

**Exception:** Automatically controlled natural ventilation systems do not require ready access and control by building occupants.

***

## SECTION 403

## MECHANICAL VENTILATION

***

**[W] 403.2 Outdoor air required.** The minimum ventilation rate of outdoor air ((~~flow rate~~)) shall be determined in accordance with Section 403.3. Ventilation supply systems shall be designed to deliver the required rate of outdoor airflow to the *breathing zone* within each *occupiable space*.

**Exception:** Where the *registered design professional* demonstrates that an engineered ventilation system ((~~design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design~~)) is designed in accordance with ASHRAE Standard 62.1 Section 6.2, Ventilation Rate Procedure, shall be permitted.

**403.2.1 Recirculation of air.** The outdoor air required by Section 403.3 shall not be recirculated. Air in excess of that required by Section 403.3 shall not be prohibited from being recirculated as a component of supply air to building spaces, except that:

1. Ventilation air shall not be recirculated from one *dwelling* to another or to dissimilar occupancies.

2. Supply air to a swimming pool and associated deck areas shall not be recirculated unless such air is dehumidified to maintain the relative humidity of the area at 60 percent or less. Air from this area shall not be recirculated to other spaces where more than 10 percent of the resulting supply airstream consists of air recirculated from these spaces.

3. Where mechanical exhaust is required by Note b in Table 403.3, recirculation of air from such spaces shall be prohibited. All air supplied to such spaces shall be exhausted, including any air in excess of that required by Table 403.3.

((~~4. Where mechanical exhaust is required by Note h in Table 403.3, mechanical exhaust is required and recirculation is prohibited where 10 percent or more of the resulting supply airstream consists of air recirculated from these spaces.~~))

4. Building HVAC air used as transfer air for heat removal may be recirculated.

**403.2.2 Transfer air.** Except where recirculation from such spaces is prohibited by Table 403.3, air transferred from occupiable spaces is not prohibited from serving as *makeup air* for required exhaust systems in such spaces as kitchens, baths, toilet rooms, elevators and smoking lounges. The amount of transfer air and *exhaust air* shall be sufficient to provide the flow rates as specified in Section 403.3. The required outdoor airflow rates specified in Table 403.3 shall be introduced directly into such spaces or into the occupied spaces from which air is transferred or a combination of both.

**403.2.3 Outdoor air delivery.** The outdoor air shall be ducted in a fully enclosed path directly to every air handling unit in each zone not provided with sufficient operable opening area for natural ventilation to occur.

**Exception:** Ducts may terminate within 12 inches of the intake to an HVAC unit if they are physically fastened so that the outdoor air duct is directed into the unit intake.

**[W] 403.3 Outdoor airflow rate.** Ventilation systems shall be designed to have the capacity to supply the minimum outdoor airflow rate determined in accordance with this section. The occupant load utilized for design of the ventilation system shall not be less than the number determined from the estimated maximum occupant load rate indicated in Table 403.3. Ventilation rates for occupancies not represented in Table 403.3 shall be those for a listed *occupancy* classification that is most similar in terms of occupant density, activities and building construction; or shall be determined by an *approved* engineering analysis. The ventilation system shall be designed to supply the required rate of *ventilation air* continuously during the period the building is occupied, except as otherwise stated in other provisions of the code.

With the exception of smoking lounges, the ventilation rates in Table 403.3 are based on the absence of smoking in occupiable spaces. Where smoking is anticipated in a space other than a smoking lounge, the ventilation system serving the space shall be designed to provide ventilation over and above that required by Table 403.3 in accordance with accepted engineering practice.

**Exception**: ((~~The occupant load is not required to be determined based on the estimated maximum occupant load rate indicated in Table 403.3 where *approved* statistical data document the accuracy of an alternate anticipated occupant density.~~)) Where occupancy density is known and documented in the plans, the outdoor air rate may be based on the design occupant density. Under no circumstance shall the occupancies used result in outdoor air less

than one-half that resulting from application of Table 403.3 estimated maximum occupancy rates.

**403.3.1 Zone outdoor airflow.** The minimum outdoor airflow required to be supplied to each zone shall be determined as a function of *occupancy* classification and space air distribution effectiveness in accordance with Sections 403.3.1.1 through 403.3.1.3.

**403.3.1.1 Breathing zone outdoor airflow.** The outdoor airflow rate required in the *breathing zone* (*Vbz*) of the *occupiable space* or spaces in a zone shall be determined in accordance with Equation 4-1.

$Vbz=RpPz+RaAz$ **(Equation 4-1)**

where:

*Az* = Zone floor area: the *net occupiable floor area* of the space or spaces in the zone.

*Pz* = Zone population: the number of people in the space or spaces in the zone.

*Rp* = People outdoor air rate: the outdoor airflow rate required per person from Table 403.3.

*Ra* = Area outdoor air rate: the outdoor airflow rate required per unit area from Table 403.3.

**TABLE 403.3**

**MINIMUM VENTILATION RATES**

| **OCCUPANCY CLASSIFICATION** | **PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING** | **AREA OUTDOOR AIRFLOW RATE IN BREATHING** | **DEFAULT OCCUPANT DENSITY #/1000 FT$^{2}$ [a]** | **EXHAUST AIRFLOW RATE CFM/FT$^{2}$ [a]** |
|---|---|---|---|---|

| | **ZONE CFM/PERSON** | **ZONE $R_a$ CFM/FT$^2$ [a]** | | |
|---|---|---|---|---|
| **Correctional facilities** | | | | |
| Cells | | | | |
| without plumbing fixtures | 5 | 0.12 | 25 | — |
| with plumbing fixtures((g))b,k | 5 | 0.12 | 25 | 1.0 |
| Dining halls (see food and beverage service) | — | — | — | — |
| Guard stations | 5 | 0.06 | 15 | — |
| Day room | 5 | 0.06 | 30 | — |
| Booking/waiting | 7.5 | 0.06 | 50 | — |
| **Dry cleaners, laundries** | | | | |
| Coin-operated dry cleaner | 15 | — | 20 | — |
| Coin-operated laundries | 7.5 | 0.06 | 20 | — |
| Commercial dry cleaner | 30 | — | 30 | — |
| Commercial laundry | 25 | — | 10 | — |
| Storage, pick up | 7.5 | 0.12 | 30 | — |
| **Education** | | | | |
| Auditoriums | 5 | 0.06 | 150 | — |

| | | | | |
|---|---|---|---|---|
| Corridors (see public spaces) | — | — | — | — |
| Media center | 10 | 0.12 | 25 | — |
| Sports locker rooms((g))b,k | — | — | — | 0.5 |
| Music/theater/dance | 10 | 0.06 | 35 | — |
| ((~~Smoking lounges~~~~b~~))j | ((~~60~~ | | ~~70~~ | —)) |
| Day care (through age 4) | 10 | 0.18 | 25 | — |
| Classrooms (ages 5-8) | 10 | 0.12 | 25 | — |
| Classrooms (age 9 plus) | 10 | 0.12 | 35 | — |
| Lecture classroom | 7.5 | 0.06 | 65 | — |
| Lecture hall (fixed seats) | 7.5 | 0.06 | 150 | — |
| Art classroom((g)) | 10 | 0.18 | 20 | 0.7 |
| Science laboratories((g))b,k | 10 | 0.18 | 25 | 1 |
| Wood/metal shops((g))b,k | 10 | 0.18 | 20 | 0.5 |
| Computer lab | 10 | 0.12 | 25 | — |
| Multiuse assembly | 7.5 | 0.06 | 100 | — |
| Locker/dressing rooms((g))b,k | — | — | — | 0.25 |
| **Food and beverage service** | | | | |
| Bars, cocktail lounges | 7.5 | 0.18 | 100 | — |
| Cafeteria, fast food | 7.5 | 0.18 | 100 | — |
| Dining rooms | 7.5 | 0.18 | 70 | — |
| Kitchens (cooking)b | — | — | — | 0.7 |

| | | | | |
|---|---|---|---|---|
| **Hospitals, nursing and convalescent homes** | | | | |
| Autopsy rooms[b] | — | — | — | 0.5 |
| Medical procedure rooms | 15 | — | 20 | — |
| Operating rooms | 30 | — | 20 | — |
| Patient rooms | 25 | — | 10 | — |
| Physical therapy | 15 | — | 20 | — |
| Recovery and ICU | 15 | — | 20 | — |
| **Hotels, motels, resorts and dormitories** | | | | |
| Multipurpose assembly | 5 | 0.06 | 120 | — |
| Bathrooms/toilet—private[((g))b,k] | — | — | — | 25/50[f] |
| Bedroom/living room | 5 | 0.06 | 10 | — |
| Conference/meeting | 5 | 0.06 | 50 | — |
| Dormitory sleeping areas | 5 | 0.06 | 20 | — |
| Gambling casinos | 7.5 | 0.18 | 120 | — |
| Lobbies/prefunction | 7.5 | 0.06 | 30 | — |
| **Offices** | | | | |
| Conference rooms | 5 | 0.06 | 50 | — |
| Office spaces | 5 | 0.06 | 5 | — |

| | | | | |
|---|---|---|---|---|
| Reception areas | 5 | 0.06 | 30 | — |
| Telephone/data entry | 5 | 0.06 | 60 | — |
| Main entry lobbies | 5 | 0.06 | 10 | — |
| **Private dwellings, single and multiple** | | | | |
| Garages, common for multiple units[b] | — | — | — | 0.75 |
| Garages, separate for each dwelling[b] | — | — | — | 100 cfm per car |
| Kitchens[b] | — | — | — | 25/100[f] |
| [W] Living areas((ϵ)) | ((~~0.35 ACH but not less than 15 cfm/person~~)) See Tables 403.8.5.1 and 403.8.5.2 | — | Based upon number of bedrooms. First bedroom, 2; each additional bedroom, 1 | — |
| [W] Toilet rooms ((~~and~~)), bathrooms((g))[b,k] and laundry areas[j] | — | — | — | 20/50[f] |

| | | | | |
|---|---|---|---|---|
| **Public spaces** | | | | |
| Corridors | — | 0.06 | — | — |
| Elevator car | — | — | — | 1 |
| Elevator lobbies in garages[l] | — | 1.0 | — | — |
| Shower room (per shower head)((g))b,k | — | — | — | 50/20[f] |
| ((~~Smoking lounges~~[b]))[j] | ((~~60~~ | — | ~~70~~ | —)) |
| Toilet rooms – public((g))b,k | — | — | — | 50/70[e] |
| Places of religious worship | 5 | 0.06 | 120 | — |
| Courtrooms | 5 | 0.06 | 70 | — |
| Legislative chambers | 5 | 0.06 | 50 | — |
| Libraries | 5 | 0.12 | 10 | — |
| Museums (children's) | 7.5 | 0.12 | 40 | — |
| Museums/galleries | 7.5 | 0.06 | 40 | — |
| **Retail stores, sales floors and showroom floors** | | | | |
| Sales (except as below) | 7.5 | 0.12 | 15 | — |
| Dressing rooms | — | — | — | 0.25 |
| Mall common areas | 7.5 | 0.06 | 40 | — |
| Shipping and receiving | — | 0.12 | — | — |
| ((~~Smoking lounges~~[b]))[j] | ((~~60~~ | — | ~~70~~ | —)) |

| | | | | |
|---|---|---|---|---|
| Storage rooms | — | 0.12 | — | — |
| Warehouses (see storage) | — | — | — | — |
| **Specialty shops** | | | | |
| Automotive motor-fuel dispensing stations[b] | — | — | — | 1.5 |
| Barber | ((~~7.5~~)) 20 | 0.06 | 25 | 0.5 |
| Beauty and nail salons[b,h] | 20 | 0.12 | 25 | 0.6 |
| Embalming room[b] | — | — | — | 2 |
| Pet shops (animal areas)[b] | 7.5 | 0.18 | 10 | 0.9 |
| Supermarkets | 7.5 | 0.06 | 8 | — |
| **Sports and amusement** | | | | |
| Disco/dance floors | 20 | 0.06 | 100 | — |
| Bowling alleys (seating areas) | 10 | 0.12 | 40 | — |
| Game arcades | 7.5 | 0.18 | 20 | — |
| Ice arenas without combustion engines | — | 0.3 | — | 0.5 |
| Gym, stadium, arena (play area) | — | 0.3 | — | — |
| Spectator areas | 7.5 | 0.06 | 150 | — |
| Swimming pools (pool and deck area) | — | 0.48 | — | — |

| | | | | |
|---|---|---|---|---|
| Health club/aerobics room | 20 | 0.06 | 40 | — |
| Health club/weight room | 20 | 0.06 | 10 | — |
| **Storage** | | | | |
| Repair garages[d] ((~~, enclosed~~)) | — | — | — | 0.75 |
| Enclosed loading docks[d] | — | — | — | 1.5 |
| Enclosed parking garages[b,d] | — | — | — | 0.75 |
| Ticket booths (within enclosed parking garage)[l] | 60 | — | — | — |
| Warehouses | — | 0.06 | — | — |
| Non-retail storage spaces (>100 $ft^2$)[k] | — | 0.06 | — | — |
| **Theaters** | | | | |
| Auditoriums (see education) | — | — | — | — |
| Lobbies | 5 | 0.06 | 150 | — |
| Stages, studios | 10 | 0.06 | 70 | — |
| Ticket booths | 5 | 0.06 | 60 | — |
| **Transportation** | | | | |
| Platforms | 7.5 | 0.06 | 100 | — |
| Transportation waiting | 7.5 | 0.06 | 100 | — |
| **Workrooms** | | | | |
| Bank vaults/safe deposit | 5 | 0.06 | 5 | — |

| | | | | |
|---|---|---|---|---|
| Darkrooms | — | — | — | 1 |
| Copy, printing rooms | 5 | 0.06 | 4 | 0.5 |
| Meat processing[c] | 15 | — | 10 | — |
| Pharmacy (prep. area) | 5 | 0.18 | 10 | — |
| Photo studios | 5 | 0.12 | 10 | — |
| Computer (without printing) | 5 | 0.06 | 4 | — |

For SI: 1 cubic foot per minute = 0.0004719$m^3$/s, 1 ton = 908 kg, 1 cubic foot per minute per square foot = 0.00508$m^3/(s \cdot m^2)$, C = [(F) -32]/1.8, 1 square foot = 0.0929$m^2$.

a. Based upon net occupiable floor area.

b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited (see Section 403.2.1, Item 3).

c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.

d. Ventilation systems ((~~in enclosed parking garages~~)) shall comply with Section 404.

e. Rates are per water closet or urinal. The higher rate shall be provided where periods of heavy use are expected to occur, such as toilets in theaters, schools and sports facilities. The lower rate shall be permitted where periods of heavy use are not expected.

f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted where the exhaust system is designed to operate continuously during normal hours of use.

[W] g. Reserved ((~~Mechanical exhaust is required and recirculation is prohibited except that recirculation shall be permitted where the resulting supply airstream consists of not more than 10 percent air recirculated from these spaces (see Section 403.2.1, Items 2 and 4).~~))

h. For nail salons, the required exhaust shall include ventilation tables or other systems that capture the contaminants and odors at their source and are capable of exhausting a minimum of 50 cfm per station.

i. RCW 70.160.030 states: "No person may smoke in a public place or in any place of employment."

[W] j. A laundry area contained within a kitchen or bathroom is not required to have source specific exhaust. When door(s) separate the area from the room, the door(s) shall be louvered.

k. Transfer air permitted in accordance with Section 403.2.2.

l. This space shall be maintained at a positive pressure. See Section 404.3.

**403.3.1.2 Zone air distribution effectiveness.** The zone air distribution effectiveness (*Ez*) shall be determined using Table 403.3.1.2.

**TABLE 403.3.1.2**

**ZONE AIR DISTRIBUTION EFFECTIVENESS[a,b,c,d,e]**

| Air Distribution Configuration | Ez |
|---|---|
| Ceiling or floor supply of cool air | 1.0[f] |
| Ceiling or floor supply of warm air and floor return | 1 |
| Ceiling supply of warm air and ceiling return | 0.8[g] |
| Floor supply of warm air and ceiling return | 0.7 |

| | |
|---|---|
| Makeup air drawn in on the opposite side of the room from the exhaust and/or return | 0.8 |
| Makeup air drawn in near to the exhaust and/or return location | 0.5 |

For SI: 1 foot = 304.8 mm, 1 foot per minute = 0.00506 m/s, °C = [(°F) – 32]/1.8.

a. "Cool air" is air cooler than space temperature.

b. "Warm air" is air warmer than space temperature.

c. "Ceiling" includes any point above the breathing zone.

d. "Floor" includes any point below the breathing zone.

e. "Makeup air" is air supplied or transferred to a zone to replace air removed from the zone by exhaust or return systems.

f. Zone air distribution effectiveness of 1.2 shall be permitted for systems with a floor supply of cool air and ceiling return, provided that low-velocity displacement ventilation achieves unidirectional flow and thermal stratification.

g. Zone air distribution effectiveness of 1.0 shall be permitted for systems with a ceiling supply of warm air, provided that supply air temperature is less than 15°F above space temperature and provided that the 150 foot-per-minute supply air jet reaches to within 41/2 feet of floor level.

**403.3.1.3 Zone outdoor airflow**. The zone outdoor airflow rate (*Voz*), shall be determined in accordance with Equation 4-2.

$$Voz = Vbz/Ez \quad \textbf{(Equation 4-2)}$$

**403.3.2 System outdoor airflow.** The outdoor air required to be supplied by each ventilation system shall be determined in accordance with Sections 403.3.2.1 through 403.2.3 as a function of system type and zone outdoor airflow rates.

**403.3.2.1 Single zone systems.** Where one air handler supplies a mixture of outdoor air and recirculated return air to only one zone, the system outdoor air intake flow rate (*Vot*) shall be determined in accordance with Equation 4-3.

$Vot = Voz$ **(Equation 4-3)**

**403.3.2.2 100-percent outdoor air systems.** Where one air handler supplies only outdoor air to one or more zones, the system outdoor air intake flow rate (*Vot*) shall be determined using Equation 4-4.

$V_{ot} = \sum_{all\ zones} V_{oz}$ **(Equation 4-4)**

**403.3.2.3 Multiple zone recirculating systems.** Where one air handler supplies a mixture of outdoor air and recirculated return air to more than one zone, the system outdoor air intake flow rate (*Vot*) shall be determined in accordance with Sections 403.3.2.3.1 through 403.3.2.3.4.

**403.3.2.3.1 Primary outdoor air fraction.** The primary outdoor air fraction (*Zp*) shall be determined for each zone in accordance with Equation 4-5.

$Zp = Voz/Vpz$ **(Equation 4-5)**

where:

*Vpz* = Primary airflow: The airflow rate supplied to the zone from the air-handling unit at which the outdoor air intake is located. It includes outdoor intake air and recirculated air from that air-

handling unit but does not include air transferred or air recirculated to the zone by other means. For design purposes, *Vpz* shall be the zone design primary airflow rate, except for zones with variable air volume supply and *Vpz* shall be the lowest expected primary airflow rate to the zone when it is fully occupied.

**403.3.2.3.2 System ventilation efficiency.** The system ventilation efficiency (*Ev*) shall be determined using Table 403.3.2.3.2 or Appendix A of ASHRAE 62.1.

**TABLE 403.3.2.3.2**

**SYSTEM VENTILATION EFFICIENCY[a,b]**

| **Max (Zp)** | **$E_v$** |
|---|---|
| ≤ 0.15 | 1 |
| ≤ 0.25 | 0.9 |
| ≤ 0.35 | 0.8 |
| ≤ 0.45 | 0.7 |
| ≤ 0.55 | 0.6 |
| ≤ 0.65 | 0.5 |
| ≤ 0.75 | 0.4 |
| > 0.75 | 0.3 |

a. *Max* (*Zp*) is the largest value of *Zp* calculated using Equation 4-5 among all the zones served by the system.

b. Interpolating between table values shall be permitted.

**403.3.2.3.3 Uncorrected outdoor air intake.** The uncorrected outdoor air intake flow rate (*Vou*) shall be determined in accordance with Equation 4-6.

$Vou = D \sum all\ zones\ RpPz + \sum all\ zones\ RaAz$ **(Equation 4-6)**

where:

*D* = Occupant diversity: the ratio of the system population to the sum of the zone populations, determined in accordance with Equation 4-7.

$D = Ps / \sum all\ zones\ Pz$ **(Equation 4-7)**

where:

*Ps* = System population: The total number of occupants in the area served by the system. For design purposes, *Ps* shall be the maximum number of occupants expected to be concurrently in all zones served by the system.

**403.3.2.3.4 Outdoor air intake flow rate.** The outdoor air intake flow rate (*Vot*) shall be determined in accordance with Equation 4-8.

$Vot = Vou / Ev$ **(Equation 4-8)**

*******

**403.6 Variable air volume system control.** Variable air volume air distribution systems, other than those designed to supply only 100-percent outdoor air, shall be provided with controls to regulate the flow of outdoor air. Such control system shall be designed to maintain the flow rate of outdoor air at a rate of not less than that required by Section 403.3 over the entire range of

supply air operating rates. Calculations and a description of controls operation shall be submitted with the permit drawings.

***

**[W] 403.8 Ventilation systems for Group R occupancies.** Each dwelling unit or guest room shall be equipped with source specific and whole house ventilation systems and shall comply with Sections 403.8.1 through 403.8.11. All public corridors and other than Group R occupied spaces that support the Group R occupancy shall meet the ventilation requirements of Section 402 or Sections 403.1 to 403.7.

**403.8.1 Minimum ventilation performance.** Ventilation systems shall be designed and installed to satisfy the ventilation requirements of Table 403.3 or Table 403.8.1.

**Table 403.8.1**

**Ventilation Rates for All Group R Private Dwellings, Single and Multiple**

(Continuously Operating Systems)

| **Floor Area** | **Bedrooms**[1] | | | | |
|---|---|---|---|---|---|
| **($ft^2$)** | **0-1** | **2-3** | **4-5** | **6-7** | **>7** |
| <1500 | 30 | 45 | 60 | 75 | 90 |
| 1501 - 3000 | 45 | 60 | 75 | 90 | 105 |
| 3001 - 4500 | 60 | 75 | 90 | 105 | 120 |
| 4501 - 6000 | 75 | 90 | 105 | 120 | 135 |
| 6001 - 7500 | 90 | 105 | 120 | 135 | 150 |

| | | | | | |
|---|---|---|---|---|---|
| >7500 | 105 | 120 | 135 | 150 | 165 |

[1]Ventilation rates in table are minimum outdoor airflow rates measured in cfm.

**403.8.2 Control and operation.**

1. Location of controls. Controls for all ventilation systems shall be readily accessible by the occupant.

2. Instructions. Operating instructions for whole house ventilation systems shall be provided to the occupant by the installer of the system.

3. Source specific ventilation systems. Source specific ventilation systems shall be controlled by manual switches, dehumidistats, timers, or other approved means.

4. Continuous whole house ventilation systems. Continuous whole house ventilation systems shall operate continuously. Exhaust fans, forced-air system fans, or supply fans shall be equipped with "fan on" as override controls. Controls shall be capable of operating the ventilation system without energizing other energy-consuming appliances. A label shall be affixed to the controls that reads "Whole House Ventilation (see operating instructions)."

5. Intermittent whole house ventilation systems. Intermittent whole house ventilation systems shall comply with the following:

5.1 They shall be capable of operating intermittently and continuously.

5.2 They shall have controls capable of operating the exhaust fans, forced-air system fans, or supply fans without energizing other energy-consuming appliances.

5.3 The system shall be designed so that it can operate automatically based on the type of control timer installed.

5.4 The Intermittent mechanical ventilation system shall operate at least one hour out of every twelve.

5.5 The system shall have a manual control and automatic control, such as a 24-hour clock timer.

5.6 At the time of final inspection, the automatic control shall be set to operate the whole house fan according to the schedule used to calculate the whole house fan sizing.

5.7 A label shall be affixed to the control that reads "Whole House Ventilation (see operating instructions)."

**403.8.3 Outdoor air intake locations.** Outdoor air intakes shall be classified as either operable openings or mechanical air intakes. The intake locations for operable openings and mechanical air intakes shall comply with the following:

1. Openings for mechanical air intakes shall comply with Section 401.4. Operable openings shall comply with Section 401.4 items 2, 4 and 5 only.

2. Intake openings shall not be located closer than 10 feet from an appliance vent outlet unless such vent outlet is 3 feet above the outdoor air inlet. The vent shall be permitted to be closer if specifically allowed by Chapter 8 or by the International Fuel Gas Code.

3. Intake openings shall be located where they will not pick up objectionable odors, fumes, or flammable vapors.

4. Intake openings shall be located where they will not take air from a hazardous or unsanitary location.

5. Intake openings shall be located where they will not take air from a room or space having a fuel-burning appliances.

6. Intake openings shall not be located closer than 10 feet from a vent opening of a plumbing drainage system unless the vent opening is at least 3 feet above the air inlet.

7. Intake openings shall not be located where they will take air from an attic, crawl space, or garage.

**403.8.4 Source specific ventilation requirements.** Source specific exhaust ventilation systems shall exhaust at least the volume of air required for exhaust in Table 403.3. Exhaust shall be provided in each kitchen, bathroom, water closet, laundry area, indoor swimming pool, spa, and other rooms where water vapor or cooking odor is produced. Source specific ventilation ducts shall terminate outdoors. Outlets shall comply with Section 501.2.1.

**403.8.4.1 Source specific exhaust systems.** Exhaust systems shall be designed and installed to meet all of the criteria below:

1. Source specific exhaust shall be discharged outdoors.

2. Exhaust outlets shall comply with Section 501.2.

3. Pressure equalization shall comply with Section 501.3.

4. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers.

5. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4.

6. Terminal outlet elements shall have at least the equivalent net free area of the ductwork.

7. Terminal outlet elements shall be screened or otherwise protected as required by Section 501.2.2.

8. Exhaust fans in separate dwelling units or guest rooms shall not share common exhaust ducts unless the system is engineered for this operation.

9. Where permitted by Chapter 5, multiple source specific exhaust ducts may be combined. If more than one of the exhaust fans in a dwelling unit or guest room shares a common exhaust duct then each exhaust fan shall be equipped with a back-draft damper to prevent the recirculation of exhaust air from one room to another room via the exhaust ducting system.

**403.8.4.2 Source specific exhaust fans.** Exhaust fan construction and sizing shall meet the following criteria.

1. Exhaust fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute: HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure.

**EXCEPTION**: Range hoods and down-draft exhaust fans used for source specific exhaust for kitchens are not required to be rated.

2. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table 403.3. The airflows required refer to the delivered airflow of

the system as installed and tested using a flow hood, flow grid, or other airflow measurement device.

**EXCEPTIONS**:

1. An exhaust airflow rating at a pressure of 0.25 in. w.g. may be used, provided the duct sizing meets the prescriptive requirements of Table 403.8.4.2.

2. Where a range hood or down draft exhaust fan is used to satisfy the source specific ventilation requirements for kitchens, the range hood or down draft exhaust shall not be less than 100 cfm at 0.10 in. w.g.

**Table 403.8.4.2**

**Prescriptive Exhaust Duct Sizing**

| **Fan Tested cfm at 0.25 inches w.g.** | **Minimum Flex Diameter** | **Maximum Length in Feet** | **Minimum Smooth Diameter** | **Maximum Length in Feet** | **Maximum Elbows[1]** |
|---|---|---|---|---|---|
| 50 | 4 inches | 25 | 4 inches | 70 | 3 |
| 50 | 5 inches | 90 | 5 inches | 100 | 3 |
| 50 | 6 inches | No Limit | 6 inches | No Limit | 3 |
| 80 | 4 inches[2] | NA | 4 inches | 20 | 3 |
| 80 | 5 inches | 15 | 5 inches | 100 | 3 |
| 80 | 6 inches | 90 | 6 inches | No Limit | 3 |
| 100 | 5 inches[2] | NA | 5 inches | 50 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| 100 | 6 inches | 45 | 6 inches | No Limit | 3 |
| 125 | 6 inches | 15 | 6 inches | No Limit | 3 |
| 125 | 7 inches | 70 | 7 inches | No Limit | 3 |

[1]. For each additional elbow, subtract 10 feet from length.

[2]. Flex ducts of this diameter are not permitted with fans of this size.

**403.8.5 Whole house ventilation requirements.** All whole house ventilation systems shall comply with Sections 403.8.5.1 and 403.8.5.2**.** Each dwelling unit or guest room shall be equipped with one of the following four types of mechanical whole house ventilation systems: A system using exhaust fans (see Section 403.8.6); a system integrated with forced-air systems (see Section 403.8.7); a system using supply fans (see Section 403.8.8); or a heat or energy recovery ventilation system (see Section 403.8.9).

**403.8.5.1 Outdoor air.** Outdoor air shall be distributed to each habitable space. Where outdoor air supply intakes are separated from exhaust vents by doors, means shall be provided to ensure airflow to all separated habitable spaces by installing distribution ducts, installed grilles, transoms, doors undercut to a minimum of 1/2- inch above the surface of the finish floor covering, or other similar means where permitted by the International Building Code.

The mechanical system shall operate continuously to supply at least the volume of outdoor air required in Table 403.3 or Table 403.8.1.

**EXCEPTION**: Intermittently operating ventilation systems: The mechanical system shall have controls for intermittent operation per Section 403.8.2 and shall supply at least the volume of

outdoor air required for intermittent operation based on the combination of its delivered capacity (from Table 403.3 or Table 403.8.1), its ventilation effectiveness (from Table 403.8.5.1) and its fractional operation time (used in Table 403.8.5.1) using the formula:

$Q_f = Q_r/(\varepsilon f)$

Where:

$Q_f$ = outdoor air flow rate

$Q_r$ = ventilation air requirement (from Table 403.3 or 403.8.1)

$\varepsilon$ = ventilation effectiveness (from Table 403.8.5.1)

f = fractional operation time is the on-time for one cycle divided by the cycle time (used in Table 403.8.5.1)

cycle time = on-time plus off-time

The intermittent mechanical ventilation system shall operate at least one hour out of every twelve. A minimum of two cycles are required per day.

**Table 403.8.5.1**

**Ventilation Effectiveness for Intermittent Fans**

| **Fractional Operation Time, f** | **Ventilation Effectiveness, $\varepsilon$[a]** |
|---|---|
| $f \leq 35\%$ | 0.33 |
| $35\% \leq f < 60\%$ | 0.5 |
| $60\% \leq f < 80\%$ | 0.75 |

| | |
|---|---|
| 80% ≤ f | 1 |

[a] If the cycle time is three hours or less and the fractional operation time (f) is 50% of greater, then 1.0 can be used as the ventilation effectiveness.

**Intermittent Mechanical Ventilation Airflow Calculation Examples:**

**Example #1:** Calculating fan airflow based on Table 403.8.5.1 values:

An intermittently operated whole house fan that serves a dwelling unit with a continuous ventilation requirement of 30 CFM (from Table 403.3 or 403.8.1) is controlled to operate with an on-time of 3 hours and off-time of 9 hours throughout the day.

The minimum intermittent ventilation rate is calculated as follows:

$Q_r$ = 30 CFM (from Table 403.3 or 403.8.1)

Cycle time = 12 hours

Fractional Operation Time (f) = 3 / (3+9) = 25%

(where: f is equal to the on-time divided by the cycle time)

(where: cycle time is equal to the on-time plus the off-time)

Ventilation Effectiveness (ε) = 0.33 (from Table 403.8.5.1)

$Q_f = Q_r / (\varepsilon f)$ = 30 CFM / (0.33) / (25%) = **364 CFM**

**Example #2:** Calculating fan airflow based on footnote a to Table 403.8.5.1:

An intermittently operated whole house fan that serves a dwelling unit with a continuous ventilation requirement of 30 CFM (from Table 403.3 or 403.8.1) is controlled to operate with an on-time of 2 hours and off-time of 1 hour throughout the day.

The minimum intermittent ventilation rate is calculated as follows:

Qr = 30 CFM (from Table 403.3 or 403.8.1)

Cycle time = 3 hours

Fractional Operation Time (f) = 2 / (2+1) = 66% (this is greater than 50%)

(where: f is equal to the on-time divided by the cycle time)

(where: cycle time is equal to the on-time plus the off-time)

Ventilation Effectiveness (ε) = 1.0 (per footnote a of Table 403.8.5.1)

$Q_f = Q_r / (\varepsilon f)$ = 30 CFM / (1.0) / (66%) = **45 CFM**

See ASHRAE 62.2-2007 Appendix B for further explanation and examples.

**403.8.5.2 Whole house supply system general requirements.** Whole house ventilation systems integrated with a forced-air system, systems using supply fans and systems using a heat or energy recovery ventilation system shall comply with the following.

1. Outdoor air louvers shall be adequately sized for the required airflow and shall comply with Section 401.5. Outdoor air intake locations shall comply with mechanical air intakes requirements of Section 403.8.3.

2. Outdoor air ducts for ventilation integrated with forced air systems and exhaust ducts for heat or energy recovery systems shall be provided with a means for balancing the system to the required airflow via balance dampers or other devices.

3. Outdoor air ducts, for ventilation integrated with forced air systems shall be provided with motorized dampers.

**EXCEPTIONS**:

1. Outdoor air ducts at heat or energy recovery ventilation systems are not required to have motorized dampers.

2. Outdoor air ducts at continuous ventilation systems are not required to have motorized dampers.

4. Outdoor air ducts in the conditioned space shall be insulated to a minimum of R-4. In heat or energy recovery ventilation systems, ducts upstream of the heat exchanger shall also be insulated to at least R-4.

Note: See *Seattle Energy Code* for additional insulation requirements.

5. All outdoor air ducts shall be designed and installed to deliver at least the outdoor airflow required by Section 403.8.5.1. The airflows required refer to the delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device.

**EXCEPTION**: The outdoor air duct for supply fan systems and heat or energy recovery systems may be prescriptively sized per Table 403.8.5.2 for dedicated outdoor air ducts upstream of the supply fan. Supply fans shall have the capacity to provide the amount of outdoor air required by Section 403.8.5.1 at 0.40 in. w.g. as per HVI 916 (April 1995). When prescriptively sized the system shall be tested and balanced using a flow hood, flow-grid, or other airflow measurement device.

6. Whole house ventilation controls for intermittent operation shall be provided at both the forced-air fan and the motorized damper.

7. Whole house ventilation controls for continuous operation shall be provided at the forced-air fan.

**Table 403.8.5.2**

**Prescriptive Supply Fan Duct Sizing**

| **Supply Fan Tested cfm at 0.40 " w.g.** | | |
|---|---|---|
| **Specified Volume from Table 408.1** | **Minimum Smooth Duct Diameter** | **Minimum Flexible Duct Diameter** |
| 50 - 90 cfm | 4 inch | 5 inch |
| 90 - 150 cfm | 5 inch | 6 inch |
| 150 - 250 cfm | 6 inch | 7 inch |
| 250 – 400 cfm | 7 inch | 8 inch |

**403.8.6 Whole house ventilation with exhaust fan systems.** This section establishes minimum requirements for mechanical whole house ventilation systems using exhaust fans.

**403.8.6.1 Outdoor air.** Exhaust fan only ventilation systems shall provide outdoor air through one of the following methods:

1. Outdoor air may be drawn through air inlets installed in exterior walls or windows. For interior spaces without openings to the outdoor, air inlets cannot be used unless a transfer fan

is provided in compliance with Section 403.8.6.1 Item 3. The air inlets shall comply with all of the following:

a. Inlets shall have controllable, secure openings and shall be designed to not compromise the thermal properties of the building envelope.

b. Inlets shall be readily accessible to occupants.

c. Inlets shall be screened or otherwise protected from entry by insects, leaves, or other material.

d. Inlets shall provide not less than 4 square inches of net free area of opening for each 10 cfm of outdoor air required in Table 403.3 or Table 403.8.1.

e. Any inlet or combination of inlets which provide 10 cfm at 10 pascals as determined by the Home Ventilation Institute Air Flow Test Standard (HVI 901 (November 1996)) are deemed equivalent to 4 square inches of net free area.

f. Each occupiable space shall have a minimum of one air inlet that has a minimum of 4 square inches of net free area.

2. In high-rise buildings, outdoor air may be drawn in through operable windows, doors, louvers or other operable openings to the outdoors. Exterior spaces shall have a minimum openable area of 4 percent of the total floor area being ventilated. Doors exiting to a corridor, court or public way shall not be used to provide outdoor air. For interior spaces without openings to the outdoors, the opening to the adjoining room shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 25 square feet. The operable openings shall comply with the following:

a. Openings shall be controllable, securable, and shall be designed to not compromise the thermal properties of the building envelope.

b. Openings shall be readily accessible to occupants.

3. For interior spaces, in buildings with air inlets in accordance with Section 403.8.6.1 Item 1 or in high-rise building without operable openings in accordance with Section 403.8.6.1 Item 2 shall have a whole house transfer fan sized to provide a minimum of the ventilation rate required per Section 403.8.5.1. The transfer fan shall circulate air between the interior room or space and the adjacent habitable space. The transfer fan may operate continuously or intermittently using controls per Section 403.8.2.

**403.8.6.2 Outside air intake locations.** All outside air intake opening types described in Section 403.8.6.1 shall be classified operable openings and shall not be classified as mechanical air intakes. The intake locations shall comply with Section 403.8.3.

**403.8.6.3 Whole house exhaust system.** Whole house exhaust system shall be designed and installed to meet all of the applicable criteria below:

1. Whole house ventilation exhaust shall be discharged outdoors.

2. Exhaust outlets shall comply with Section 501.2.

3. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers.

4. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4.5. Terminal outlet elements shall have at least the equivalent net free area of the ductwork.

5. Terminal outlet elements shall be screened or otherwise protected as required by Section 501.2.2.

6. One of the required source specific exhaust fans for the laundry room or bathroom may be designated as the whole house exhaust fan.

7. Exhaust fans in separate dwelling units or guest rooms shall not share common exhaust ducts unless the system is engineered for this operation.

8. Where permitted by Chapter 5 whole house exhaust ducts may be combined with other source specific exhaust ducts. If more than one of the exhaust fans in a dwelling unit or guest room shares a common exhaust duct then each exhaust fan shall be equipped with a back-draft damper to prevent the recirculation of exhaust air from one room to another room via the exhaust ducting system.

**403.8.6.4 Whole house exhaust and transfer fans.** Exhaust fan construction and sizing shall meet the following criteria.

1. Exhaust and transfer fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute (HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure).

2. Installation of system or equipment shall be carried out in accordance with manufacturers' design requirements and installation instructions.

3. Fan airflow rating and duct system shall be designed and installed to deliver at least the outdoor airflow required by Table 403.3 or Table 403.8.1. The airflows required refer to the

delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device.

**EXCEPTION**: An airflow rating at a pressure of 0.25 in. w.g. may be used, provided the duct sizing meets the prescriptive requirements of Table 403.8.5.2.

**403.8.6.5 Fan noise.** Whole house exhaust and transfer fans located 4 feet or less from the interior grille shall have a sone rating of 1.0 or less measured at 0.10 inches water gauge. Manufacturer's noise ratings shall be determined as per HVI 915. Remotely mounted fans shall be acoustically isolated from the structural elements of the building and from attached ductwork using insulated flexible duct or other approved material.

**403.8.7 Whole house ventilation integrated with forced-air systems.** This section establishes minimum requirements for mechanical whole house ventilation systems using forced-air system fans.

**403.8.7.1 Outdoor air.** Forced-air system fan ventilation systems shall provide outdoor air through one of the following methods:

1. A dedicated outdoor air louver and outdoor air duct for each dwelling unit or guest room shall supply outdoor air to the return side of the forced-air system fan; or

2. A central outdoor air delivery system that supplies multiple dwelling units or guest rooms shall supply outdoor air to the return side of the forced air system fan.

**403.8.7.2 Whole house forced-air system.** Where outdoor air is provided to each habitable dwelling unit or guest room by a forced air system, the outdoor air duct shall be connected to the return air stream at a point within 4 feet upstream of the forced-air unit. It shall not be connected

directly to the forced-air unit cabinet in order to prevent thermal shock to the heat exchanger. At a minimum, filtration of the outdoor air shall be provided at the forced-air unit. The filter shall be accessible for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 6.

**403.8.8 Whole house ventilation with supply fan systems.** This section establishes minimum requirements for mechanical whole house ventilation systems using supply fan systems.

**403.8.8.1 Outdoor air.** Supply fan ventilation systems shall provide outdoor air through one of the following methods:

1. A dedicated outdoor air louver and outdoor air duct for each dwelling unit or guest room shall supply outdoor air to a supply fan; or

2. A central outdoor air supply fan system shall distribute unconditioned or conditioned air to multiple dwelling units or guest rooms.

**403.8.8.2 Whole house supply system.** Where outdoor air is provided to each habitable dwelling unit or guest room by supply fan systems the outdoor air shall be filtered.

The system filter may be located at the intake device or in line with the fan. The filter shall be accessible for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 6.

**403.8.9 Whole house ventilation with heat recovery or energy recovery ventilation systems.** This section establishes minimum requirements for mechanical whole house ventilation systems using heat recovery or energy recovery ventilation systems.

**403.8.9.1 Outdoor air.** Heat recovery or energy recovery ventilation systems shall provide outdoor air through one of the following methods:

1. A dedicated outdoor air louver and outdoor air duct for each dwelling unit or guest room shall supply outdoor air to the heat recovery or energy recovery ventilator; or

2. A central outdoor air heat recovery or energy recovery unit shall distribute conditioned air to multiple dwelling units or guest rooms.

**403.8.9.2 Whole house heat recovery ventilator system.** Where outdoor air is provided to each habitable dwelling unit or guest room by heat recovery or energy recovery ventilator the outdoor air shall be filtered. The filter shall be located on the upstream side of the heat exchanger in both the intake and exhaust airstreams with a Minimum Efficiency Rating Value (MERV) of at least 6. The system filter may be located at the intake device or in line with the fan. The filter shall be accessible for regular maintenance and replacement.

**403.8.10 Source specific exhaust ventilation and whole house ventilation alternate performance or design requirements.** In lieu of complying with Sections 403.8.4 or 403.8.5 compliance with the section shall be demonstrated through engineering calculations by an engineer licensed to practice in the state of Washington or by performance testing. Documentation of calculations or performance test results shall be submitted to and approved by the code official. Performance testing shall be conducted in accordance with approved test methods.

**403.8.11 Alternate systems.** When approved by the code official, systems designed in accordance with ASHRAE Standard 62.2-2007 shall be permitted.

**403.9 Corridors.** Air movement in corridors shall comply with Section 601 of this code and the *International Building Code*.

## SECTION 404

## ((~~ENCLOSED PARKING GARAGES~~))

## VENTILATION OF ENCLOSED MOTOR VEHICLE OCCUPANCIES

**404.1 Enclosed parking garage**((~~s~~))**, loading dock, and motor vehicle repair garage exhaust ventilation systems.** Mechanical ventilation systems for enclosed parking garages, loading docks, and motor vehicle repair garages shall ((~~be permitted to~~)) operate ((~~intermittently~~)) continuously to provide ventilation per Section 404.2. ((~~where t~~))The system ((~~is~~)) shall be arranged to operate automatically upon detection of vehicle operation or the presence of occupants by *approved* automatic detection devices and shall be equipped with gas-sensor systems that modulate the ventilation system by staging fans or varying fan speed to maintain gas concentrations below specified maximum levels. All equipment used in sensor-controlled systems shall be designed for the specific use and installed in accordance with the manufacturer's instructions. Mechanical ventilation systems and gas sensor systems controls shall comply with Section 1412.9 of the *Washington State Energy Code with Seattle Amendments*.

**404.1.1 Ventilation makeup air.** Ventilation makeup air shall be mechanically supplied to levels of enclosed loading docks and parking garages more than 3 stories above or below the nearest garage or loading dock entrance or exit.

**404.1.2 Exhaust termination point.** Exhaust termination points shall comply with Section 501.2.1 of the Seattle Mechanical Code.

**404.2 Minimum ventilation.**

**404.2.1 Enclosed parking garages and motor vehicle repair garages.** In enclosed parking garages and motor vehicle repair garages ((A))automatic operation of the system shall not reduce the ventilation airflow rate below 0.05 cfm per square foot (0.00025 $m^3/s \cdot m^2$) of the floor area and the ventilation system shall be capable of producing a ventilation airflow rate of 0.75 cfm per square foot (((0.0076)) 0.0038 $m^3/s \cdot m^2$) of floor area.

**Exception:** Ventilation systems located in areas with automated parking systems where the engines of the motor vehicles are not operating shall provide a continuous ventilation airflow rate of 50 cfm per parking stall. This exception does not apply to the vehicle drop off area.

**404.2.2 Enclosed loading docks.** In enclosed loading docks automatic operation of the system shall not reduce the ventilation airflow rate below 1.0 cfm per square foot (0.00507 $m^3/s \cdot m^2$) of the floor area and the ventilation systems shall be capable of producing a ventilation airflow rate of 1.5 cfm per square foot (0.0076 $m^3/s \cdot m^2$) of floor area.

**404.3 Occupied spaces accessory to public garages and motor vehicle repair garages.** Connecting offices, waiting rooms, ticket booths, elevator lobbies and similar uses that are accessory to a public garage or motor vehicle repair garage shall be maintained at a positive pressure relative to the garage and shall be provided with ventilation in accordance with Section 403.3.

**404.4 Motor vehicle repair garages.** In buildings used for the repair of motor vehicles, each repair stall or stand shall be equipped with an exhaust capture system that connects directly to the repair engine exhaust source and prevents the escape of fumes. The exhaust system shall exhaust

to the outdoor atmosphere. See Section 502.14 for additional requirements. Ventilation shall be provided for the motor vehicle repair garage in accordance with Section 404.1.

**SECTION 405**

**SYSTEMS CONTROL**

**405.1 General.** Mechanical ventilation systems shall be provided with manual or automatic controls that will operate such systems whenever the spaces are occupied. Air-conditioning systems that supply required *ventilation air* shall be provided with controls designed to automatically maintain the required outdoor air supply rate during occupancy. Additional mechanical system control requirements are contained in the *Washington State Energy Code with Seattle Amendments*.

**SECTION 406**

**VENTILATION OF UNINHABITED SPACES**

**406.1 General.** ((~~Uninhabited spaces, such as c~~)) Crawl spaces and attics((~~,~~)) shall be provided with *natural ventilation* openings as required by the *International Building Code* or shall be provided with a mechanical exhaust and supply air system. The mechanical exhaust rate shall be not less than 0.02 cfm per square foot (0.00001 $m^3/s \cdot m^2$) of horizontal area and shall be automatically controlled to operate when the relative humidity in the space served exceeds 60 percent.

Section 6. The following sections of Chapter 5 of the International Mechanical Code, 2009 Edition, are amended as follows:

# CHAPTER 5

# EXHAUST SYSTEMS

***

**501.2 Exhaust discharge.** The air removed by every mechanical exhaust system shall be discharged outdoors at a point where it will not cause a nuisance and not less than the distances specified in Section 501.2.1. The air shall be discharged to a location from which it cannot again be readily drawn in by a ventilating system. Air shall not be exhausted into an attic or crawl space.

**[W] Exceptions:**

1. Whole-house ((~~ventilation-type attic~~)) cooling fans shall be permitted to discharge into the attic space of *dwelling units* having private attics.

2. Commercial cooking recirculating systems.

**501.2.1 Location of exhaust outlets.** The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

1. For ducts conveying explosive or flammable vapors, fumes or dusts: 30 feet (9144 mm) from property lines; 10 feet (3048 mm) from operable openings into buildings; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls and operable openings into buildings which are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.

**Interpretation:** Item 1 includes carpentry shop exhaust, industrial chemical lab, paint shop and sandblasting exhaust systems.

2. For other product-conveying outlets: 10 feet (3048 mm) from the property lines; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from operable openings into buildings; 10 feet (3048 mm) above adjoining grade.

**Interpretation:** Item 2 includes central vacuum systems, dry cleaner, photo lab, school chemical lab and combustion engine exhaust.

3. For all *environmental air* exhaust other than enclosed parking garage and transformer vault exhaust: 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable openings into buildings for all occupancies other than Group U, and 10 feet (3048 mm) from mechanical air intakes. Such exhaust shall not be considered hazardous or noxious.

**[W] Exceptions:**

1. The separation between an air intake and exhaust outlet on a single listed package HVAC unit.

2. Exhaust from environmental air systems other than garages may be discharged into an open parking garage.

3. Except for Group I occupancies, where ventilation system design circumstances require building HVAC air to be relieved, such as during economizer operation, such air may be relieved into an open or enclosed parking garage within the same building.

4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above the design flood level.

[W] 5. For enclosed parking garage, loading dock, and motor vehicle repair garage exhaust outlets: Exhaust ventilation openings and duct terminations shall be located not less than 10 feet (3048 mm) from property lines, operable openings into buildings, and mechanical air intakes; 10 feet (3048 mm) above adjoining finished sidewalk grade. Exhaust outlets extending to the roof shall extend 3 feet (914 mm) above the roof surface.

[W] 6. For elevator machinery rooms in enclosed or open parking garages: Exhaust outlets may discharge air directly into the parking garage.

7. For transformer vault exhaust systems: Exhaust ventilation openings and duct terminations shall be located not less than 10 feet (3048 mm) above adjoining finished sidewalk grade and not less than 10 feet (3048 mm) from fire escapes, required means of egress, combustible materials, unprotected openings, operable openings and property lines. Exhaust outlets shall be located on the exterior of the building. See *Seattle Building Code* Section 425 for additional requirements.

((~~5~~)) 8. For specific systems see the following sections:

((~~5.1~~)) 8.1. Clothes dryer exhaust, Section 504.4.

((~~5.2~~)) 8.2. Kitchen hoods and other kitchen exhaust *equipment*, Sections 506.3.12, 506.4 and 506.5.

((~~5.3~~)) 8.3. Dust stock and refuse conveying systems, Section 511.

((~~5.4~~)) 8.4. Subslab soil exhaust systems, Section 512.4

((~~5.5~~)) 8.5. Smoke control systems, Section 513.10.3

((~~5.6~~)) 8.6. Refrigerant discharge, Section1105.7

((~~5.7~~)) 8.7. Machinery room discharge, Section 1105.6.1

**501.2.1.1 Exhaust discharge.** *Exhaust air* shall not be directed onto walkways in such a manner that the users of the walkway are subjected to the exhaust air stream.

**Note:** Seattle Land Use Code (Municipal Code Title 23) requires that the venting of odors, vapors, smoke, cinders, dust, gas and fumes shall be at least 10 feet (3048 mm) above finished sidewalk grade, and directed away as much as possible from residential uses within 50 feet (15 240 mm) of the vent in some locations.

**501.2.2 Exhaust opening protection.** Exhaust openings that terminate outdoors shall be protected with corrosion- resistant screens, louvers or grilles. Openings in screens, louvers and grilles shall be sized not less than 1/4 inch (6 mm) and not larger than 1/2 inch (13 mm). Openings shall be protected against local weather conditions. Outdoor openings located in exterior walls shall meet the provisions for exterior wall opening protectives in accordance with the *International Building Code*.

***

**501.4 Ducts.** Where exhaust duct construction is not specified in this chapter, such construction shall comply with Chapter 6.

**Interpretation:** For purposes of this section, property line includes any property line separating one lot from another lot, but does not include any property line separating a lot from a public street or alley right-of-way.

## SECTION 502

## REQUIRED SYSTEMS

**502.1 General.** An exhaust system shall be provided, maintained and operated as specifically required by this section and for all occupied areas where machines, vats, tanks, furnaces, forges, salamanders and other *appliances, equipment* and processes in such areas produce or throw off dust or particles sufficiently light to float in the air, or which emit heat, odors, fumes, spray, gas or smoke, in such quantities so as to be irritating or injurious to health or safety. These exhaust systems are considered product-conveying systems.

**502.1.1 Exhaust inlet location.** The inlet to an exhaust system shall be located in the area of heaviest concentration of contaminants.4

**[F] 502.1.2 Fuel-dispensing areas.** The bottom of an air inlet or exhaust opening in fuel-dispensing areas shall be located not more than 18 inches (457 mm) above the floor.

**502.1.3 Equipment, appliance and service rooms.** *Equipment*, *appliance* and system service rooms that house sources of odors, fumes, noxious gases, smoke, steam, dust, spray or other contaminants shall be designed and constructed so as to prevent spreading of such contaminants to other occupied parts of the building.

**[F] 502.1.4 Hazardous exhaust.** The mechanical exhaust of high concentrations of dust or hazardous vapors shall conform to the requirements of Section 510.

***

**[F] 502.4 Stationary storage battery systems.** Stationary storage battery systems having a liquid capacity of not more than 50 gallons, as regulated by Section 608 of the *International Fire Code,* shall be provided with ventilation in accordance with this chapter and Sections 502.4.1 ((~~or~~)) and 502.4.2.

**Exception:** Lithium-ion batteries shall not require ventilation.

**[F] 502.4.1 Hydrogen limit in rooms.** For flooded lead acid, flooded nickel cadmium and VRLA batteries, the ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room.

**[F] 502.4.2 Ventilation rate in rooms.** Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (cfm/ft$^2$) [0.00508 m$^3$/(s •m$^2$)] of floor area of the room.

**[F] 502.4.3 Supervision.** Mechanical ventilation systems where required by Section 502.4 shall be supervised by an *approved* central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

**[F] 502.5 Valve-regulated lead-acid batteries in cabinets.** Valve-regulated lead-acid (VRLA) batteries installed in cabinets, as regulated by Section 608.6.2 of the *International Fire Code,* shall be provided with ventilation in accordance with Sections 502.5.1 and ((~~or~~)) 502.5.2.

**[F] 502.5.1 Hydrogen limit in cabinets.** The cabinet ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the cabinet during the worst-case event of simultaneous boost charging of all batteries in the cabinet.

**[F] 502.5.2 Ventilation rate in cabinets.** Continuous cabinet ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (cfm/ft$^2$) [0.00508 m$^3$/(s • m$^2$)] of the floor area covered by the cabinet. The room in which the cabinet is installed shall also be ventilated as required by Sections 502.4.1 ((~~or~~)) and 502.4.2.

**[F] 502.5.3 Supervision.** Mechanical ventilation systems where required by Section 502.5 shall be supervised by an *approved* central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

***

**[F] 502.7 Application of flammable finishes.** Mechanical exhaust as required by this section shall be provided for operations involving the application of flammable finishes.

Spray finishing operations conducted in Group A, E, I or R occupancies shall be located in a spray room separated vertically and horizontally from other areas in accordance with the *International Building Code*. In other occupancies, spray-finishing operations shall be conducted in a spray room, spray booth or limited spraying area approved for such use.

**[F] 502.7.1 During construction.** Ventilation shall be provided for operations involving the application of materials containing flammable solvents in the course of construction, *alteration* or demolition of a structure.

**[F] 502.7.2 Limited spraying spaces.** Positive mechanical ventilation which provides a minimum of six complete air changes per hour shall be installed in limited spraying spaces. Such system shall meet the requirements of the *International Fire Code* for handling flammable vapors. Explosion venting is not required.

**[F] 502.7.3 Flammable vapor areas.** Mechanical ventilation of flammable vapor areas shall be provided in accordance with Sections 502.7.3.1 through 502.7.3.6.

**[F] 502.7.3.1 Operation.** Mechanical ventilation shall be kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and finishing material residue to be exhausted. Spraying *equipment* shall be interlocked with the ventilation of the flammable vapor area such that spraying operations cannot be conducted unless the ventilation system is in operation.

**[F] 502.7.3.2 Recirculation.** Air exhausted from spraying operations shall not be recirculated.

**Exceptions:**

1. Air exhausted from spraying operations shall be permitted to be recirculated as *makeup air* for unmanned spray operations provided that:

   1.1. The solid particulate has been removed.

   1.2. The vapor concentration is less than 25 percent of the lower flammable limit (LFL).

   1.3. *Approved equipment* is used to monitor the vapor concentration.

   1.4. An alarm is sounded and spray operations are automatically shut down if the vapor concentration exceeds 25 percent of the LFL.

   1.5. In the event of shutdown of the vapor concentration monitor, 100 percent of the air volume specified in Section 510 is automatically exhausted.

2. Air exhausted from spraying operations is allowed to be recirculated as *makeup air* to manned spraying operations where all of the conditions provided in Exception 1 are included

in the installation and documents have been prepared to show that the installation does not pose a life safety hazard to personnel inside the spray booth, spraying space or spray room.

**[F] 502.7.3.3 Air velocity.** Ventilation systems shall be designed, installed and maintained such that the average air velocity over the open face of the booth, or booth cross section in the direction of airflow during spraying operations, is not less than 100 feet per minute (0.51 m/s).

**[F] 502.7.3.4 Ventilation obstruction.** Articles being sprayed shall be positioned in a manner that does not obstruct collection of overspray.

**[F] 502.7.3.5 Independent ducts.** Each spray booth and spray room shall have an independent exhaust duct system discharging to the outdoors.

**Exceptions:**

1. Multiple spray booths having a combined frontal area of 18 square feet (1.67 $m^2$) or less are allowed to have a common exhaust where identical spray-finishing material is used in each booth. If more than one fan serves one booth, such fans shall be interconnected so that all fans operate simultaneously.

2. Where treatment of exhaust is necessary for air pollution control or energy conservation, ducts shall be allowed to be manifolded if all of the following conditions are met:

2.1. The sprayed materials used are compatible and will not react or cause ignition of the residue in the ducts.

2.2. Nitrocellulose-based finishing material shall not be used.

2.3. A filtering system shall be provided to reduce the amount of overspray carried into the duct manifold.

2.4. Automatic sprinkler protection shall be provided at the junction of each booth exhaust with the manifold, in addition to the protection required by this chapter.

**[F] 502.7.3.6 Fan motors and belts.** Electric motors driving exhaust fans shall not be placed inside booths or ducts. Fan rotating elements shall be nonferrous or nonsparking or the casing shall consist of, or be lined with, such material. Belts shall not enter the duct or booth unless the belt and pulley within the duct are tightly enclosed.

**[F] 502.7.4 Dipping operations.** Flammable vapor areas of dip tank operations shall be provided with mechanical ventilation adequate to prevent the dangerous accumulation of vapors. Required ventilation systems shall be so arranged that the failure of any ventilating fan will automatically stop the dipping conveyor system.

**[F] 502.7.5 Electrostatic apparatus.** The flammable vapor area in spray-finishing operations involving electrostatic apparatus and devices shall be ventilated in accordance with Section 502.7.3.

**[F] 502.7.6 Powder coating.** Exhaust ventilation for powder- coating operations shall be sufficient to maintain the atmosphere below one-half of the minimum explosive concentration for the material being applied. Nondeposited, air-suspended powders shall be removed through exhaust ducts to the powder recovery system.

**[F] 502.7.7 Floor resurfacing operations.** To prevent the accumulation of flammable vapors during floor resurfacing operations, mechanical ventilation at a minimum rate of 1 cfm/$ft^2$ [0.00508 $m^3/(s \bullet m^2)$] of area being finished shall be provided. Such exhaust shall be by *approved* temporary or portable means. Vapors shall be exhausted to the exterior of the building.

***

**502.14 Motor vehicle operation.** In areas where motor vehicles operate, mechanical ventilation shall be provided in accordance with Section 403. Additionally, areas in which stationary motor vehicles are operated shall be provided with a *source capture system* that connects directly to the motor vehicle exhaust systems. When the source capture system extends more than 10 feet from the tailpipe connection to the outdoors, the system shall exhaust at a rate of 600 cfm for heavy-duty diesel vehicles and at a rate of 300 cfm for all other vehicles.

**Exceptions:**

1. This section shall not apply where the motor vehicles being operated or repaired are electrically powered.
2. This section shall not apply to one- and two-family dwellings.
3. This section shall not apply to motor vehicle service areas where engines are operated inside the building only for the duration necessary to move the motor vehicles in and out of the building.

**[F] 502.15 Repair garages and other spaces.** Where Class I liquids or LP-gas are stored or used within a building having a basement or pit wherein flammable vapors could accumulate, the basement or pit shall be provided with ventilation designed to prevent the accumulation of flammable vapors therein.

***

**502.18 Specific rooms.** Specific rooms, including bathrooms, locker rooms, smoking lounges and toilet rooms, shall be exhausted in accordance with the ventilation requirements of Chapter 4.

**Interpretation:** RCW 70.160.030 states: "No person may smoke in a public place or in any place of employment." A public place is defined in RCW 70.160.020 in part as: "…A public place does not include a private residence unless the private residence is used to provide licensed child care, foster care, adult care, or other similar social service care on the premises. This chapter is not intended to restrict smoking in private facilities which are occasionally open to the public except upon the occasions when the facility is open to the public."

***

## SECTION 504

## CLOTHES DRYER EXHAUST

***

**504.2 Exhaust penetrations.** Where a clothes dryer exhaust duct penetrates a wall or ceiling membrane, the annular space shall be sealed with noncombustible material, *approved* fire caulking or a noncombustible dryer exhaust duct wall receptacle. Ducts that exhaust clothes dryers shall not penetrate or be located within any fireblocking, draftstopping or any wall, floor/ceiling or other assembly required by the *International Building Code* to be fire-resistance rated, unless such duct is constructed of galvanized steel or aluminum of the thickness specified in Section 603.4 and the fire-resistance rating is maintained in accordance with the *International*

*Building Code*. Fire dampers, combination fire/smoke dampers and any similar devices that will obstruct the exhaust flow shall be prohibited in clothes dryer exhaust ducts.

**504.2.1 Protection required.** Protective shield plates shall be placed where nails or screws from finish or other work are likely to penetrate the clothes dryer exhaust duct. Shield plates shall be placed on the finished face of all framing members where there is less than 11/4 inches (32 mm) between the duct and the finished face of the framing member. Protective shield plates shall be constructed of steel, have a thickness of 0.062 inch (1.6 mm) and extend a minimum of 2 inches (51 mm) above sole plates and below top plates.

***

**504.4 Exhaust installation.** Dryer exhaust ducts for clothes dryers shall terminate on the outside of the building and shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the exhaust flow. Clothes dryer exhaust ducts shall not be connected to a vent connector, vent or *chimney*. ((~~Clothes dryer exhaust ducts shall not extend into or through ducts or plenums.~~))

***

**504.6 Domestic clothes dryer ducts.** Exhaust ducts for domestic clothes dryers shall conform to the requirements of Sections 504.6.1 through 504.6.7.

**504.6.1 Material and size.** Exhaust ducts shall have a smooth interior finish and shall be constructed of metal a minimum 0.016 inch (0.4 mm) thick. The exhaust duct size shall be 4 inches (102 mm) nominal in diameter.

**504.6.2 Duct installation.** Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct.

**504.6.3 Transition ducts.** Transition ducts used to connect the dryer to the exhaust duct system shall be a single length that is *listed* and *labeled* in accordance with UL 2158A.

Transition ducts shall be a maximum of 8 feet (2438 mm) in length and shall not be concealed within construction.

**504.6.4 Duct length.** The maximum allowable exhaust duct length shall be determined by one of the methods specified in Section 504.6.4.1 or 504.6.4.2.

**504.6.4.1 Specified length.** The maximum length of the exhaust duct shall be 35 feet (10 668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table 504.6.4.1.

**[W] Exception:** The maximum length of the duct may be increased in an engineered exhaust system when a listed and labeled dryer exhaust booster fan is installed in accordance with the manufacturer's installation instructions.

**504.6.4.2 Manufacturer's instructions.** The maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The code official shall be provided with a copy of the installation instructions for the make and model of the dryer. Where the exhaust duct is to be concealed, the installation instructions shall be provided to the code

official prior to the concealment inspection. In the absence of fitting equivalent length calculations from the clothes dryer manufacturer, Table 504.6.4.1 shall be used.

**504.6.5 Length identification.** Where the exhaust duct is concealed within the building construction, the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.

**504.6.6 Exhaust duct required.** Where space for a clothes dryer is provided, an exhaust duct system shall be installed. Where the clothes dryer is not installed at the time of occupancy, the exhaust duct shall be capped at the location of the future dryer.

**Exception:** Where a *listed* condensing clothes dryer is installed prior to occupancy of structure.

((~~**504.6.7 Protection required.** Protective shield plates shall be placed where nails or screws from finish or other work are likely to penetrate the clothes dryer exhaust duct. Shield plates shall be placed on the finished face of all framing members where there is less than 11/4 inches (32 mm) between the duct and the finished face of the framing member. Protective shield plates shall be constructed of steel, have a thickness of 0.062 inch (1.6 mm) and extend a minimum of 2 inches (51 mm) above sole plates and below top plates.~~))

*******

**504.8 Common exhaust systems for clothes dryers located in multistory structures.** Where a common multistory duct system is designed and installed to convey exhaust from multiple clothes dryers, the construction of the system shall be in accordance with all of the following:

1. The shaft in which the duct is installed shall be constructed and fire-resistance rated as required by the *International Building Code*.

2. Dampers shall be prohibited in the exhaust duct. Penetrations of the shaft and ductwork shall be protected in accordance with Section 607.5.5, Exception 2.

3. Rigid metal ductwork shall be installed within the shaft to convey the exhaust. The ductwork shall be constructed of sheet steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage) and in accordance with SMACNA *Duct Construction Standards*.

4. The ductwork within the shaft shall be designed and installed without offsets.

5. The exhaust fan motor design shall be in accordance with Section 503.2.

6. The exhaust fan motor shall be located outside of the airstream.

7. The exhaust fan shall run continuously, and shall be connected to a <u>legally required</u> standby power source.

8. Exhaust fan operation shall be monitored in an *approved* location and shall initiate an audible or visual signal when the fan is not in operation.

9. Makeup air shall be provided for the exhaust system.

10. A cleanout opening shall be located at the base of the shaft to provide *access* to the duct to allow for cleaning and inspection. The finished opening shall be not less than 12 inches by 12 inches (305 mm by 305 mm).

11. Screens shall not be installed at the termination.

## SECTION 505

## DOMESTIC KITCHEN EXHAUST EQUIPMENT

**<u>[W]</u> 505.1 Domestic systems.** Where domestic range hoods and domestic appliances equipped with downdraft exhaust are located within dwelling units, such hoods and appliances shall

discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls and shall be air tight and equipped with a backdraft damper. Domestic range hood duct systems shall not be combined with other exhaust systems.

Listed and labeled exhaust booster fans shall be permitted when installed in accordance with the manufacturer's installation instructions.

**Exceptions:**

1. Where installed in accordance with the manufacturer's installation instructions and where mechanical or *natural ventilation* is otherwise provided in accordance with Chapter 4, *listed* and *labeled* ductless range hoods shall not be required to discharge to the outdoors.

**Interpretation:** When a recirculating hood is used in a domestic kitchen, the kitchen shall have environmental air exhaust that complies with Table 403.3 and Section 501.

2. Ducts for domestic kitchen cooking appliances equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

2.1. The duct shall be installed under a concrete slab poured on grade.

2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.

2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.

2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.

2.5. The PVC ducts shall be solvent cemented.

***

## SECTION 506

## COMMERCIAL KITCHEN HOOD VENTILATION SYSTEM DUCTS AND EXHAUST EQUIPMENT

***

**506.3 Ducts serving Type I hoods.** Type I exhaust ducts shall be independent of all other exhaust systems except as provided in Section 506.3.5. Commercial kitchen duct systems serving Type I hoods shall be designed, constructed and installed in accordance with Sections 506.3.1 through 506.3.12.3.

**506.3.1 Duct materials.** Ducts serving Type I hoods shall be constructed of materials in accordance with Sections 506.3.1.1 and 506.3.1.2.

**506.3.1.1 Grease duct materials.** Grease ducts serving Type I hoods shall be constructed of steel having a minimum thickness of 0.0575 inch (1.463 mm) (No. 16 gage) or stainless steel not less than 0.0450 inch (1.14 mm) (No. 18 gage) in thickness.

**Exception:** Factory-built commercial kitchen grease ducts *listed* and *labeled* in accordance with UL 1978 and installed in accordance with Section 304.1.

**506.3.1.2 Makeup air ducts.** Makeup air ducts connecting to or within 18 inches (457 mm) of a Type I hood shall be constructed and installed in accordance with Sections 603.1, 603.3, 603.4,

603.9, 603.10 and 603.12. Duct insulation installed within 18 inches (457 mm) of a Type I hood shall be noncombustible or shall be *listed* for the application.

**506.3.2 Joints, seams and penetrations of grease ducts.** Joints, seams and penetrations of grease ducts shall be made with a continuous liquid-tight weld or braze made on the external surface of the duct system.

**Exceptions:**

1. Penetrations shall not be required to be welded or brazed where sealed by devices that are *listed* for the application.

2. Internal welding or brazing shall not be prohibited provided that the joint is formed or ground smooth and is provided with ready access for inspection.

3. Factory-built commercial kitchen grease ducts *listed* and *labeled* in accordance with UL 1978 and installed in accordance with Section 304.1.

**506.3.2.1 Duct joint types.** Duct joints shall be butt joints, welded flange joints with a maximum flange depth of 1/2 inch (12.7 mm) or overlapping duct joints of either the telescoping or bell type. Overlapping joints shall be installed to prevent ledges and obstructions from collecting grease or interfering with gravity drainage to the intended collection point. The difference between the inside cross-sectional dimensions of overlapping sections of duct shall not exceed 1/4 inch (6 mm). The length of overlap for overlapping duct joints shall not exceed 2 inches (51 mm).

**506.3.2.2 Duct-to-hood joints.** Duct-to-hood joints shall be made with continuous internal or external liquid- tight welded or brazed joints. Such joints shall be smooth, accessible for inspection, and without grease traps.

**Exceptions:** This section shall not apply to:

1. A vertical duct-to-hood collar connection made in the top plane of the hood in accordance with all of the following:

1.1. The hood duct opening shall have a 1-inch-deep (25 mm), full perimeter, welded flange turned down into the hood interior at an angle of 90 degrees (1.57 rad) from the plane of the opening.

1.2. The duct shall have a 1-inch-deep (25 mm) flange made by a 1-inch by 1-inch (25 mm by 25 mm) angle iron welded to the full perimeter of the duct not less than 1 inch (25 mm)above the bottom end of the duct.

1.3. A gasket rated for use at not less than 1,500ºF (815ºC) is installed between the duct flange and the top of the hood.

1.4. The duct-to-hood joint shall be secured by stud bolts not less than 1/4 inch (6.4 mm) in diameter welded to the hood with a spacing not greater than 4 inches (102 mm) on center for the full perimeter of the opening. All bolts and nuts are to be secured with lockwashers.

2. *Listed* and *labeled* duct-to-hood collar connections installed in accordance with Section 304.1.

**506.3.2.3 Duct-to-exhaust fan connections.** Duct-to-exhaust fan connections shall be flanged and gasketed at the base of the fan for vertical discharge fans; shall be flanged, gasketed and

bolted to the inlet of the fan for side-inlet utility fans; and shall be flanged, gasketed and bolted to the inlet and outlet of the fan for in-line fans.

**506.3.2.4 Vibration isolation.** A vibration isolation connector for connecting a duct to a fan shall consist of noncombustible packing in a metal sleeve joint of *approved* design or shall be a coated-fabric flexible duct connector *listed* and *labeled* for the application. Vibration isolation connectors shall be installed only at the connection of a duct to a fan inlet or outlet.

**506.3.2.5 Grease duct test.** Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides. The permit holder shall be responsible to provide the necessary *equipment* and perform the grease duct leakage test. A light test shall be performed to determine that all welded and brazed joints are liquid tight.

A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A test shall be performed for the entire duct system, including the hood-to-duct connection. The ductwork shall be permitted to be tested in sections, provided that every joint is tested. For *listed* factory-built grease ducts, this test shall be limited to duct joints assembled in the field and shall exclude factory welds.

**506.3.3 Grease duct supports.** Grease duct bracing and supports shall be of noncombustible material securely attached to the structure and designed to carry gravity and seismic loads within

the stress limitations of the *International Building Code*. Bolts, screws, rivets and other mechanical fasteners shall not penetrate duct walls.

**506.3.4 Air velocity.** Grease duct systems serving a Type I hood shall be designed and installed to provide an air velocity within the duct system of not less than 500 feet per minute (2.5 m/s).

**Exception:** The velocity limitations shall not apply within duct transitions utilized to connect ducts to differently sized or shaped openings in hoods and fans, provided that such transitions do not exceed 3 feet (914 mm) in length and are designed to prevent the trapping of grease.

**506.3.5 Separation of grease duct system.** A separate grease duct system shall be provided for each Type I hood. A separate grease duct system is not required where all of the following conditions are met:

1. All interconnected hoods are located within the same story.
2. All interconnected hoods are located within the same room or in adjoining rooms.
3. Interconnecting ducts do not penetrate assemblies required to be fire-resistance rated.
4. The grease duct system does not serve solid-fuel-fired appliances.

**506.3.6 Grease duct clearances.** Where enclosures are not required, grease duct systems and exhaust *equipment* serving a Type I hood shall have a *clearance* to combustible construction of not less than 18 inches (457 mm), and shall have a *clearance* to noncombustible construction and gypsum wallboard attached to noncombustible structures of not less than 3 inches (76 mm).

**Exceptions:**

1. Factory-built commercial kitchen grease ducts *listed* and *labeled* in accordance with UL 1978.

2. *Listed* and *labeled* exhaust *equipment* installed in accordance with Section 304.1.

3. Where commercial kitchen grease ducts are continuously covered on all sides with a *listed* and *labeled* field-applied grease duct enclosure material, system, product or method of construction specifically evaluated for such purpose in accordance with ASTM E 2336, the required *clearance* shall be in accordance with the listing of such material, system, product or method.

**506.3.7 Prevention of grease accumulation in grease ducts.** Duct systems serving a Type I hood shall be constructed and installed so that grease cannot collect in any portion thereof, and the system shall slope not less than one-fourth unit vertical in 12 units horizontal (2 percent slope) toward the hood or toward an *approved* grease reservoir. Where horizontal ducts exceed 75 feet (22 860 mm) in length, the slope shall not be less than one unit vertical in 12 units horizontal (8.3 percent slope).

**506.3.8 Grease duct cleanouts and other openings.** Grease duct systems shall not have openings therein other than those required for proper operation and maintenance of the system. Any portion of such system having sections not provided with access from the duct entry or discharge shall be provided with cleanout openings. Cleanout openings shall be equipped with tight-fitting doors constructed of steel having a thickness not less than that required for the duct. Doors shall be equipped with a substantial method of latching, sufficient to hold the door tightly closed. Door assemblies, including any frames and gasketing, shall be *approved* for the purpose, and shall not have fasteners that penetrate the duct. *Listed* and *labeled* access door assemblies shall be installed in accordance with the terms of the listing.

**506.3.8.1 Personnel entry.** Where ductwork is large enough to allow entry of personnel, not less than one *approved* or *listed* opening having dimensions not less than 22 inches by 20 inches (559 mm by 508 mm) shall be provided in the horizontal sections, and in the top of vertical risers. Where such entry is provided, the duct and its supports shall be capable of supporting the additional load, and the cleanouts specified in Section 506.3.8 are not required.

**506.3.8.2 Cleanouts serving in-line fans.** A cleanout shall be provided for both the inlet side and outlet side of an in-line fan except where a duct does not connect to the fan. Such cleanouts shall be located within 3 feet (914 mm) of the fan duct connections.

**506.3.9 <u>Grease duct cleanout location, spacing and installation.</u>**

**<u>506.3.9.1</u> Grease duct horizontal cleanouts.** Cleanouts located on horizontal sections of ducts shall be spaced not more than 20 feet (6096 mm) apart. The cleanouts shall be located on the side of the duct with the opening not less than 11/2 inches (38 mm) above the bottom of the duct, and not less than 1 inch (25 mm) below the top of the duct. The opening minimum dimensions shall be 12 inches (305 mm) on each side. Where the dimensions of the side of the duct prohibit the cleanout installation prescribed herein, the openings shall be on the top of the duct or the bottom of the duct. Where located on the top of the duct, the opening edges shall be a minimum of 1 inch (25 mm) from the edges of the duct. Where located in the bottom of the duct, cleanout openings shall be designed to provide internal damming around the opening, shall be provided with gasketing to preclude grease leakage, shall provide for drainage of grease down the duct around the dam and shall be *approved* for the application. Where the dimensions of the sides, top or bottom of the duct preclude the installation of the prescribed minimum-size cleanout opening,

the cleanout shall be located on the duct face that affords the largest opening dimension and shall be installed with the opening edges at the prescribed distances from the duct edges as previously set forth in this section.

**[W] 506.3.9.2 Grease duct vertical cleanouts.** Where ducts pass vertically through floors, cleanouts shall be provided. A minimum of one cleanout shall be provided on each floor. Cleanout openings shall be not less than 1 1/2 inches (38 mm) from all outside edges of the duct or welded seams. The opening minimum dimensions shall be 12 inches (305 mm) on each side.

**506.3.10 Grease duct enclosures.** A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall penetrate exterior walls only at locations where unprotected openings are permitted by the *International Building Code*. The duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems. Duct enclosures shall be either field-applied or factory-built. Duct enclosures shall have a fire-resistance rating not less than that of the floor assembly penetrated, but need not exceed 2 hours. Duct enclosures shall be as prescribed by Section 506.3.10.1, 506.3.10.2 or 506.3.10.3.

**506.3.10.1 Shaft enclosure.** Commercial kitchen grease ducts constructed in accordance with Section 506.3.1 shall be permitted to be enclosed in accordance with the *International Building Code* requirements for shaft construction. Such grease duct systems and exhaust *equipment* shall have a *clearance* to combustible construction of not less than 18 inches (457 mm), and shall have a *clearance* to noncombustible construction and gypsum wallboard attached to noncombustible structures of not less than 6 inches (76 mm). Duct enclosures shall be sealed around the duct at

the point of penetration and vented to the outside of the building through the use of weather-protected openings.

**Interpretation:** Gypsum wallboard installed on a combustible substrate or on wood studs does not cause the wall to be considered as a noncombustible assembly, and the 18 inch minimum clearance still applies. The classification of combustible and noncombustible materials is not changed by the use of fire-retardant-treated wood products or fire rated (Type "X") gypsum wallboard.

**506.3.10.2 Field-applied grease duct enclosure.** Commercial kitchen grease ducts constructed in accordance with Section 506.3.1 shall be enclosed by a field-applied grease duct enclosure that is a *listed* and *labeled* material, system, product or method of construction specifically evaluated for such purpose in accordance with ASTM E 2336. The surface of the duct shall be continuously covered on all sides from the point at which the duct originates to the outlet terminal. Duct penetrations shall be protected with a through-penetration firestop system classified in accordance with ASTM E 814 or UL 1479 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such systems shall be installed in accordance with the listing and the manufacturer's installation instructions. Exposed duct wrap systems shall be protected where subject to physical damage.

**506.3.10.3 Factory-built grease duct assemblies.** Factory- built grease duct assemblies incorporating integral enclosure materials shall be *listed* and *labeled* for use as commercial kitchen grease duct assemblies in accordance with UL 2221. Duct penetrations shall be protected with a through-penetration firestop system classified in accordance with ASTM E 814 or UL

1479 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such assemblies shall be installed in accordance with the listing and the manufacturer's installation instructions.

**506.3.10.4 Duct enclosure not required.** A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

**506.3.11 Grease duct fire-resistive access opening.** Where cleanout openings are located in ducts within a fire-resistance-rated enclosure, access openings shall be provided in the enclosure at each cleanout point. Access openings shall be equipped with tight-fitting sliding or hinged doors that are equal in fire-resistive protection to that of the shaft or enclosure. An *approved* sign shall be placed on access opening panels with wording as follows: "ACCESS PANEL. DO NOT OBSTRUCT."

**506.3.12 Exhaust outlets serving Type I hoods.** Exhaust outlets for grease ducts serving Type I hoods shall conform to the requirements of Sections 506.3.12.1 through 506.3.12.3.

**506.3.12.1 Termination above the roof.** Exhaust outlets that terminate above the roof shall have the discharge opening located not less than 40 inches (1016 mm) above the roof surface.

**506.3.12.2 Termination through an exterior wall.** Exhaust outlets shall be permitted to terminate through exterior walls where the smoke, grease, gases, vapors and odors in the discharge from such terminations do not create a public nuisance or a fire hazard. Such terminations shall not be located where protected openings are required by the *International Building Code*. Other exterior openings shall not be located within ((~~3~~)) 10 feet (((~~914~~)) 3048 mm) of such terminations.

**Note:** See Director's Rule 6-2005, or any rule superseding Director's Rule 6-2005 for additional requirements.

**506.3.12.3 Termination location.** Exhaust outlets shall be located not less than 10 feet (3048 mm) horizontally from parts of the same or contiguous buildings, adjacent buildings and adjacent property lines and shall be located not less than 10 feet (3048 mm) above the adjoining grade level. Exhaust outlets shall be located not less than 10 feet (3048 mm) horizontally from or not less than 3 feet (914 mm) above air intake openings into any building.

**Exception:** Exhaust outlets shall terminate not less than 5 feet (1524 mm) from parts of the same or contiguous building, an adjacent building, adjacent property line and air intake openings into a building where air from the exhaust outlet discharges away from such locations.

**Interpretation:** For purposes of this section, property line includes any property line separating one lot from another lot, but does not include any property line separating a lot from a public street or alley right-of-way.

**506.4 Ducts serving Type II hoods.** Single or combined Type II exhaust systems for food-processing operations shall be independent of all other exhaust systems. Commercial kitchen exhaust systems serving Type II hoods shall comply with Sections 506.4.1 and 506.4.2.

**506.4.1 Ducts.** Ducts and plenums serving Type II hoods shall be constructed of rigid metallic materials. Duct construction, installation, bracing and supports shall comply with Chapter 6. A duct serving a Type II hood that penetrates a fire-resistance-rated ceiling, floor or wall shall be

enclosed in a duct enclosure from the point of penetration to the outlet terminal. Ducts subject to positive pressure and ducts conveying moisture-laden or waste-heat-laden air shall be constructed, joined and sealed in an *approved* manner.

**506.4.2 Type II terminations.** Exhaust outlets serving Type II hoods shall terminate in accordance with the hood manufacturer's installation instructions and shall comply with all of the following:

1. Exhaust outlets shall terminate not less than 3 feet (914 mm) in any direction from openings into the building.

2. Outlets shall terminate not less than 10 feet (3048 mm)from property lines or buildings on the same lot.

3. Outlets shall terminate not less than 10 feet (3048 mm) above grade.

4. Outlets that terminate above a roof shall terminate not less than 30 inches (762 mm)above the roof surface.

5. Outlets shall terminate not less than 30 inches (762 mm) from exterior vertical walls

6. Outlets shall be protected against local weather conditions.

7. Outlets shall not be directed onto walkways.

8. Outlets shall meet the provisions for exterior wall opening protectives in accordance with the *International Building Code.*

*******

## SECTION 507

## COMMERCIAL KITCHEN HOODS

***

**507.2 Where required.** A Type I or Type II hood shall be installed at or above all *commercial cooking appliances* in accordance with Table 507.2 (1) and Sections 507.2.1 and 507.2.2. Where any cooking *appliance* under a single hood requires a Type I hood, a Type I hood shall be installed. Where a Type II hood is required, a Type I or Type II hood shall be installed.

**507.2.1 Type I hoods.** Type I hoods shall be installed where cooking *appliances* produce grease or smoke. Type I hoods shall be installed over *medium-duty*, *heavy-duty* and *extra-heavy-duty cooking appliances*. Type I hoods shall be installed over *light-duty cooking appliances* that produce grease or smoke.

**[W] Exception:** A Type I hood is not required in R-2 occupancies with not more than 16 residents.

**507.2.1.1 Operation.** Type I hood systems shall be designed and installed to automatically activate the exhaust fan whenever cooking operations occur. The activation of the exhaust fan shall occur through an interlock with the cooking appliances, by means of heat sensors or by means of other *approved* methods.

**507.2.2 Type II hoods.** Type II hoods shall be installed for collecting and removing steam, vapor, heat or odors from ((~~above~~)) dishwashers and *light-duty cooking appliances* that produce heat or moisture and do not produce grease or smoke, except where the heat and moisture loads from such appliances are incorporated into the HVAC system design or into the design of a separate removal system. Type II hoods shall be installed for collecting and removing steam, vapor, heat or odors from ((~~above~~)) all *light-duty appliances* that produce products of *combustion*

and do not produce grease or smoke. Spaces containing cooking appliances that do not require Type II hoods shall be ventilated in accordance with Section 403.3. For the purpose of determining the floor area required to be ventilated, each individual *appliance* that is not required to be installed under a Type II hood shall be considered as occupying not less than 100 square feet (9.3 $m^2$).

**507.2.3 Domestic cooking appliances used for commercial purposes.** Domestic cooking appliances utilized for commercial purposes shall be provided with Type I ((~~or,~~)) Type II or residential hoods ((~~as required for the type of appliances and processes~~)) in accordance with Table 507.2 (2) and Sections 507.2, 507.2.1 and 507.2.2.

**507.2.4 Extra-heavy-duty.** Type I hoods for use over *extra-heavy-duty cooking appliances* shall not cover *heavy-*, *medium-* or *light-duty appliances*. Such hoods shall discharge to an exhaust system that is independent of other exhaust systems.

**Note:** The definition of extra-heavy-duty cooking appliance includes appliances using solid fuel.

**Table 507.2.1 Type of Hood Required for Commercial Cooking Appliances**

| TYPE OF APPLIANCE[1] | TYPE OF HOOD REQUIRED[2] | | |
|---|---|---|---|
| | TYPE I[3] | TYPE II | NONE |
| Baking oven | Solid fuel | > 6 kW | ≤ 6 kW |
| Charbroiler | All sizes | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Coffee maker | | > 6 kW | ≤ 6 kW | | |
| Coffee roaster[4] | | All sizes | | | |
| Convection ovens (electric) | | > 6 kW | < 6 kW | | |
| Deep-fat fryer | All sizes | | | | |
| Dishwasher | | > 140°F | ≤ 140°F | | |
| Grill | All sizes | | | | |
| Hot dog display heater | | > 6 kW | ≤ 6 kW | | |
| Microwave oven | | | All sizes | | |
| Pastry oven | | > 6 kW | ≤ 6 kW | | |
| Pizza oven | Solid fuel | > 6 kW | ≤ 6 kW | | |
| Popcorn maker | | > 6 kW | ≤ 6 kW | | |
| Roasting oven[5] | > 6 kW | ≤ 6 kW | | | |
| Roll warmer | | > 6 kW | ≤ 6 kW | | |
| Solid-fuel burning appliances | All sizes & all food products | | | | |
| Soup warmer, soup preparation cooking unit | | > 6 kW | ≤ 6 kW | | |
| Steam reconstitution device | | > 6 kW | ≤ 6 kW | | |

| | | | | | |
|---|---|---|---|---|---|
| Steam table | | > 6 kW | ≤ 6 kW | | |
| Steamer | | > 6 kW | ≤ 6 kW | | |
| Toaster | | > 6 kW | ≤ 6 kW | | |
| Warming oven | | > 6 kW | ≤ 6 kW | | |

[1] The code official shall determine hood requirements for appliances not listed in the table.

[2] Section 507.2 defines Type I and Type II kitchen hoods.

[3] The definition of extra-heavy-duty cooking appliance includes all appliances utilizing solid fuel.

[4] Puget Sound pollution control requires an after-burner for particulates.

[5]Roasting ovens are used to cook raw or partially cooked food.

**Table 507.2.2 Type Of Hood Required for Domestic Cooking Appliances [1,2]**

**In The Following Spaces**

| Type of Space | Type of cooking | Type of hood |
|---|---|---|
| Church | 1) boiling, steaming and warming precooked food | Type II hood |
| | 2) roasting, pan frying and deep frying | Type I hood |
| Community or Party Room in apartment and condominium | 1) boiling, steaming and warming precooked food | Residential hood[3] or Type II [4] |
| | 2) roasting, pan frying and deep frying | Type I |
| Day Care | 1) boiling, steaming and warming precooked food | Residential hood[3] or Type II [4] |
| | 2) roasting, pan frying and deep frying | Type I |
| Dormitory, Boarding home, Nursing Home | 1) boiling, steaming and warming precooked food | Type II |
| | 2) roasting, pan frying and deep frying | Type I |
| Office lunch room | 1) boiling, steaming and warming precooked food | Residential hood[3] or Type II [4] |
| | 2) roasting, pan frying and deep frying | Type I |

[1] Commercial cooking appliances shall comply with Section 507.2

[2] Requirements in this table apply to electric or gas fuel appliances only. Solid fuel appliances or charbroilers require Type I hood.

[3] Residential hood shall vent to outside

[4] Type II hood required when more than one appliance is used

***

**507.13 Capacity of hoods.** Commercial food service hoods shall exhaust a minimum net quantity of air determined in accordance with this section and Sections 507.13.1 through 507.13.4. The net quantity of *exhaust air* shall be calculated by subtracting any airflow supplied directly to a hood cavity from the total exhaust flow rate of a hood. Where any combination of *heavy-duty*, *medium-duty* and *light-duty cooking appliances* are utilized under a single hood, the exhaust rate required by this section for the heaviest duty *appliance* covered by the hood shall be used for the entire hood.

**507.13.1 Extra-heavy-duty (solid fuel) cooking appliances.** The minimum net airflow for hoods, as determined by Section 507.2, used for *extra-heavy-duty cooking appliances* shall be determined as follows:

| **Type of Hood** | **CFM per linear foot of hood** |
|---|---|
| Backshelf/pass-over | Not allowed |
| Double island canopy (per side) | 550 |
| Eyebrow | Not allowed |
| Single island canopy | 700 |
| Wall-mounted canopy | 550 |

For SI: 1 cfm per linear foot = 1.55 L/s per linear meter.

**507.13.2 Heavy-duty cooking appliances.** The minimum net airflow for hoods, as determined by Section 507.2, used for *heavy-duty cooking appliances* shall be determined as follows:

| **Type of Hood** | **CFM per linear foot of hood** |
|---|---|
| Backshelf/pass-over | 400 |
| Double island canopy (per side) | 400 |
| Eyebrow | Not allowed |
| Single island canopy | 600 |
| Wall-mounted canopy | 400 |

For SI: 1 cfm per linear foot = 1.55 L/s per linear meter.

**507.13.3 Medium-duty cooking appliances.** The minimum net airflow for hoods, as determined by Section 507.2, used for *medium-duty cooking appliances* shall be determined as follows:

| **Type of Hood** | **CFM per linear foot of hood** |
|---|---|
| Backshelf/pass-over | 300 |
| Double island canopy (per side) | 300 |
| Eyebrow | 250 |
| Single island canopy | 500 |
| Wall-mounted canopy | 300 |

For SI: 1 cfm per linear foot = 1.55 L/s per linear meter.

**507.13.4 Light-duty cooking appliances.** The minimum net airflow for hoods, as determined by Section 507.2, used for *light-duty cooking appliances* and food service preparation shall be determined as follows:

| **Type of Hood** | **CFM per linear foot of hood** |
|---|---|
| Backshelf/pass-over | 250 |
| Double island canopy (per side) | 250 |
| Eyebrow | 250 |
| Single island canopy | 400 |
| Wall-mounted canopy | 200 |

For SI: 1 cfm per linear foot = 1.55 L/s per linear meter.

**507.13.5 Dishwashing appliances.** The minimum net airflow for Type II hoods used for dishwashing appliances shall be 100 CFM per linear foot of hood length.

**Exception:** Dishwashing appliances and *equipment* installed in accordance with Section 507.2.2.

*******

## SECTION 508

## COMMERCIAL KITCHEN MAKEUP AIR

**508.1 Makeup air.** *Makeup air* shall be supplied during the operation of commercial kitchen exhaust systems that are provided for *commercial cooking appliances*. ((~~The amount of *makeup air* supplied to the building from all sources shall be approximately equal to the amount of *exhaust air* for all exhaust systems for the building.~~)) A separate makeup air system for the

kitchen shall supply not less than 90 percent of the air to be exhausted. The *makeup air* shall not reduce the effectiveness of the exhaust system. *Makeup air* shall be provided by gravity or mechanical means or both. Mechanical *makeup air* systems shall be automatically controlled to start and operate simultaneously with the exhaust system. Exterior windows and doors shall not be used to provide commercial kitchen makeup air. When individual kitchen hoods are designed to exhaust greater than 5000 cfm, refer to *Washington State Energy Code with Seattle Amendments* Section 1439.1 for additional makeup air system requirements. *Makeup air* intake opening locations shall comply with Section 401.4.

**Exceptions:**

1. The total makeup air for the exhaust system is less than 400 cfm; or

2. In atriums, food courts, and similar areas, occupant ventilation air that would otherwise exfiltrate or be exhausted by other mechanical exhaust systems may be used to provide all makeup air, or a portion of makeup air when a direct path through permanent openings exists for occupant ventilation air to transfer to the kitchen hood area. That portion of air not supplied by occupant ventilation air shall be provided by a separate makeup air system. The combined air quantity provided by a separate makeup air system and occupant ventilation air shall provide 100 percent of the air to be exhausted.

**508.1.1 Makeup air temperature.** The temperature differential between *makeup air* and the air in the conditioned space shall not exceed 10ºF (6ºC) if the amount of makeup air supply exceeds 2,500 cfm (1180 L/s) per space except where the added heating and cooling loads of the *makeup air* do not exceed the capacity of the HVAC system.

***

## SECTION 510

## HAZARDOUS EXHAUST SYSTEMS

***

**510.2 Where required.** A hazardous exhaust system shall be required wherever operations involving the handling or processing of hazardous materials, in the absence of such exhaust systems and under normal operating conditions, have the potential to create one of the following conditions:

1. A flammable vapor, gas, fume, mist or dust is present in concentrations exceeding 25 percent of the lower flammability limit of the substance for the expected room temperature.

2. A vapor, gas, fume, mist or dust with a health-hazard rating of 4 is present in any concentration.

3. A vapor, gas, fume, mist or dust with a health-hazard rating of 1, 2 or 3 is present in concentrations exceeding 1 percent of the median lethal concentration of the substance for acute inhalation toxicity.

~~((**Exception:** Laboratories, as defined in Section 510.1, except where the concentrations listed in Item 1 are exceeded or a vapor, gas, fume, mist or dust with a health-hazard rating of 1, 2, 3 or 4 is present in concentrations exceeding 1 percent of the median lethal concentration of the substance for acute inhalation toxicity.))~~

In lieu of complying with this section, research and educational laboratories are permitted to comply with rules adopted by the Director for laboratory exhaust systems for hazardous materials.

**Note:** See Director's Rule 30-2005, or any rule superseding Director's Rule 30-2005 for alternate provisions for research and education laboratories.

**[F] 510.2.1 Lumber yards and woodworking facilities.** *Equipment* or machinery located inside buildings at lumber yards and woodworking facilities which generates or emits combustible dust shall be provided with an *approved* dust-collection and exhaust system installed in conformance with this section and the *International Fire Code*. *Equipment* and systems that are used to collect, process or convey combustible dusts shall be provided with an *approved* explosion-control system.

**[F] 510.2.2 Combustible fibers.** *Equipment* or machinery within a building which generates or emits combustible fibers shall be provided with an *approved* dust-collecting and exhaust system. Such systems shall comply with this code and the *International Fire Code*.

**510.2.3 Model shops and other intermittent use facilities.** Equipment or machinery located inside buildings that emit dust but are used on an intermittent basis, such as in model shops, research and development facilities, hobby, and other non-production uses, shall be provided with a local, point of use dust collection system. The dust collector is permitted to be a portable type with high efficiency filters to allow exhaust air to be discharged back into the space. Such collectors are not required to be provided with an approved explosion-control system. Such systems shall be limited to no more than 1,000 cfm.

***

**510.7 Suppression required.**

**510.7.1 Ducts.** Ducts shall be protected with an *approved* automatic fire suppression system installed in accordance with the *International Building Code*.

**Exceptions:**

1. An *approved* automatic fire suppression system shall not be required in ducts conveying materials, fumes, mists and vapors that are nonflammable and noncombustible under all conditions and at any concentrations.

2. An *approved* automatic fire suppression system shall not be required in ducts where the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).

3. For laboratories, as defined in Section 510.1, automatic fire protection systems shall not be required in laboratory hoods or exhaust systems.

4. An *approved* automatic fire suppression system is not required in metallic ducts if all fume hoods served by the duct are equipped with an approved fire suppression system.

**510.7.2 Fume hoods.** Approved automatic fire suppression shall be installed in fume hoods within which operations are conducted involving hazardous materials that have the potential to create a flammable vapor, gas, fume, mist, or dust in concentrations exceeding 25 percent of the lower flammability limit of the substance or mixture for the expected room temperature in the absence of the fume hood and under normal operating conditions.

***

## SECTION 511

## DUST, STOCK AND REFUSE CONVEYING SYSTEMS

***

**511.1 Dust, stock and refuse conveying systems.** Dust, stock and refuse conveying systems shall comply with the provisions of Section 510 and Sections 511.1.1 through 511.2.

**511.1.1 Collectors and separators.** Collectors and separators involving such systems as centrifugal separators, bag filter systems and similar devices, and associated supports shall be constructed of noncombustible materials and shall be located on the exterior of the building or structure. A collector or separator shall not be located nearer than 10 feet (3048mm) to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe that extends above the highest part of any roof with a distance of 30 feet (9144 mm). The dust collecting equipment shall be interlocked with the machinery power supply so that the machinery cannot be operated without the dust-collection equipment also operating.

**Exceptions:**

1. Collectors such as "Point of Use" collectors, close extraction weld fume collectors, spray finishing booths, stationary grinding tables, sanding booths, and integrated or machine-mounted collectors shall be permitted to be installed indoors provided the installation is in accordance with the *International Fire Code* and ((~~NFPA 70~~)) the *Seattle Electrical Code*.

2. Collectors in independent exhaust systems handling combustible dusts shall be permitted to be installed indoors provided that such collectors are installed in compliance with the *International Fire Code* and ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**511.1.2 Discharge pipe.** Discharge piping shall conform to the requirements for ducts, including clearances required for high-heat appliances, as contained in this code. A delivery pipe from a cyclone collector shall not convey refuse directly into the firebox of a boiler, furnace, dutch oven, refuse burner, incinerator or other *appliance.*

**511.1.3 Conveying systems exhaust discharge.** An exhaust system shall discharge to the outside of the building either directly by flue or indirectly through the bin or vault into which the system discharges except where the contaminants have been removed. Exhaust system discharge shall be permitted to be recirculated provided that the solid particulate has been removed at a minimum efficiency of 99.9 percent at 10 microns (10.01 mm), vapor concentrations are less than 25 percent of the LFL, and *approved equipment* is used to monitor the vapor concentration.

**511.1.4 Spark protection.** The outlet of an open-air exhaust terminal shall be protected with an *approved* metal or other noncombustible screen to prevent the entry of sparks.

**511.1.5 Explosion relief vents.** A safety or explosion relief vent shall be provided on all systems that convey combustible refuse or stock of an explosive nature, in accordance with the requirements of the *International Building Code*.

**511.1.5.1 Screens.** Where a screen is installed in a safety relief vent, the screen shall be attached so as to permit ready release under the explosion pressure.

**511.1.5.2 Hoods.** The relief vent shall be provided with an *approved* noncombustible cowl or hood, or with a counterbalanced relief valve or cover arranged to prevent the escape of hazardous materials, gases or liquids.

*******

## SECTION 512

## SUBSLAB SOIL EXHAUST SYSTEMS

***

**512.2 Materials.** Subslab soil exhaust system duct material shall be air duct material *listed* and *labeled* to the requirements of UL 181 for Class 0 air ducts, or any of the following piping materials that comply with the ((~~*International*~~)) *Uniform Plumbing Code* as building sanitary drainage and vent pipe: cast iron; galvanized steel; brass or copper pipe; copper tube of a weight not less than that of copper drainage tube, Type DWV; and plastic piping.

***

## SECTION 513

## SMOKE CONTROL SYSTEMS

***

**[F] 513.3 Special inspection and test requirements.** In addition to the ordinary inspection and test requirements which buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 of the *International Building Code* shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the *construction documents* shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the

particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms as found in Section 1704 of the *International Building Code*.

**Note:** See SFD Administrative Rules 9.01.04 and 9.02.04 for further specific requirements.

***

**[F] 513.11 Power systems.** The smoke control system shall be supplied with two sources of power. Primary power shall be the normal building power systems. Secondary power shall be from an *approved* ((~~standby~~)) emergency source complying with Chapter 27 of the *International Building Code* and the *Seattle Electrical Code*. The ((~~standby~~)) emergency power source and its transfer switches shall be in a room separate from the normal power transformers and switch gear and ventilated directly to and from the exterior. The room shall be enclosed with not less than 1-hour fire-resistance-rated fire barriers constructed in accordance with Section 707 of the *International Building Code* or horizontal assemblies constructed in accordance with Section 712 of *International Building Code*, or both. Power distribution from the two sources shall be by independent routes. Transfer to full ((~~standby~~)) emergency power shall be automatic and within 60 seconds of failure of the primary power. The systems shall comply with ((~~NPFA 70~~)) the *Seattle Electrical Code*.

**Exception:** A generator set with a diesel fuel tank system exceeding 660 gallons is not required to be located in a rated room when installed in a sprinklered parking garage of type I or II construction, unless a 1-hour separation is required to separate control areas in accordance with the *International Fire Code*.

**[F] 513.11.1 Power sources and power surges.** Elements of the smoke management system relying on volatile memories or the like shall be supplied with uninterruptible power sources of sufficient duration to span 15-minute primary power interruption. Elements of the smoke management system susceptible to power surges shall be suitably protected by conditioners, suppressors or other *approved* means.

**[F] 513.11.2 Wiring.** In addition to meeting requirements of the *Seattle Electrical Code,* all wiring regardless of voltage, shall have fire-resistance-rated protection of at least two hours or as required in rules promulgated by the code official.

**Exception:** Subject to the approval of the code official, fire-resistance-rating is not required for wiring located in a parking garage.

**[F] 513.12 Detection and control systems.** Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Chapter 9 of the *International Building Code* and NFPA 72. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control *equipment*. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override, the presence of power downstream of all disconnects and, through a preprogrammed weekly test sequence report, abnormal conditions audibly, visually and by printed report.

**[F] 513.12.1 Wiring. ((**~~In addition to meeting the requirements of NFPA70, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.~~)) See Section 513.11.

**[F] 513.12.2 Activation.** Smoke control systems shall be activated in accordance with the *International Building Code*.

**[F] 513.12.3 Automatic control.** Where completely automatic control is required or used, the automatic control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 903.3.1.1 of the *International Fire Code*, ((~~or~~)) from manual controls that are readily accessible to the fire department, and any smoke detectors in the building ((~~required by engineering analysis~~)).

***

## SECTION 514

## ENERGY RECOVERY VENTILATION SYSTEMS

**514.1 General.** Energy recovery ventilation systems shall be installed in accordance with this section. Where required for purposes of energy conservation, energy recovery ventilation systems shall also comply with the ((~~*International Energy Conservation Code*~~)) *Washington State Energy Code with Seattle Amendments*.

***

Section 7. The following sections of Chapter 6 of the International Mechanical Code, 2009 Edition, are amended as follows:

## CHAPTER 6

## DUCT SYSTEMS

## SECTION 601

## GENERAL

***

**[B] 601.2 Air movement in egress elements.** Corridors shall not serve as supply, return, exhaust, relief or *ventilation air* ducts.

**Exceptions:**

1. Use of a corridor as a source of *makeup air* for exhaust systems in rooms that open directly onto such corridors, including toilet rooms, bathrooms, dressing rooms, ((~~smoking lounges~~)) and janitor closets, shall be permitted, provided that each such corridor is directly supplied with ((~~outdoor~~)) air at a rate greater than the rate of *makeup air* taken from the corridor.

2. Where located within a *dwelling unit*, the use of corridors for conveying return air shall not be prohibited.

3. Where located within tenant spaces of 1,000 square feet (93 $m^2$) or less in area, use of corridors for conveying return air is permitted.

4. Incidental air movement from pressurized rooms within health care facilities, provided that the corridor is not the primary source of supply or return to the room.

[W] 5. Where such air is part of an engineered smoke control system.

[W] 6. Air supplied to corridors serving residential occupancies shall not be considered as providing ventilation air to the dwelling units subject to the following:

6.1 The air supplied to the corridor is one hundred percent outside air; and

6.2 The dwelling units have ventilation air independent of the air supplied to the corridor; and

6.3 For other than high-rise buildings, the supply fan will automatically shut off upon activation of corridor smoke detectors which shall be spaced at no more than 30 feet (9144 mm) on center along the corridor; or

6.4 For high-rise buildings, the supply fan will automatically shut off upon activation of the smoke detectors required by Seattle Fire Code Section 907.2.13.1 or upon receipt of another *approved* fire alarm signal. The supply fan is not required to be automatically shut off when used as part of an *approved* building stairwell or elevator hoistway pressurization system.

**[B] 601.2.1 Corridor ceiling.** Use of the space between the corridor ceiling and the floor or roof structure above as a return air *plenum* is permitted for one or more of the following conditions:

1. The corridor is not required to be of fire-resistance- rated construction;
2. The corridor is separated from the *plenum* by fire-resistance- rated construction;
3. The air-handling system serving the corridor is shut down upon activation of the air-handling unit smoke detectors required by this code;
4. The air-handling system serving the corridor is shut down upon detection of sprinkler waterflow where the building is equipped throughout with an automatic sprinkler system; or
5. The space between the corridor ceiling and the floor or roof structure above the corridor is used as a component of an *approved* engineered smoke control system.

***

## SECTION 602

## PLENUMS

***

**602.2 Construction.** *Plenum* enclosures shall be constructed of materials permitted for the type of construction classification of the building.

The use of gypsum boards to form plenums shall be limited to systems where the air temperatures do not exceed 125ºF (52ºC) and the building and mechanical system design conditions are such that the gypsum board surface temperature will be maintained above the airstream dew-point temperature as determined by the registered design professional. Air plenums formed by gypsum boards shall not be incorporated in air-handling systems utilizing evaporative coolers.

**602.2.1 Materials within plenums.** Except as required by Sections 602.2.1.1 through 602.2.1.6, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723.

**Exceptions:**

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.
3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials fully enclosed within continuous noncombustible raceways or enclosures, *approved* gypsum board assemblies or within materials *listed* and *labeled* for such application.

**602.2.1.1 Wiring.** Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a *plenum* shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with NFPA 262. Only type OFNP (*plenum* rated nonconductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be *listed* and *labeled* as *plenum* rated and shall be installed in accordance with ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**602.2.1.2 Fire sprinkler piping.** Plastic fire sprinkler piping exposed within a *plenum* shall be used only in wet pipe systems and shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread of not greater than 5 feet (1524 mm) when tested in accordance with UL 1887. Piping shall be *listed* and *labeled*.

**602.2.1.3 Pneumatic tubing.** Combustible pneumatic tubing exposed within a *plenum* shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread of not greater than 5 feet (1524 mm) when tested in accordance with UL 1820. Combustible pneumatic tubing shall be *listed* and *labeled*.

**602.2.1.4 Electrical equipment in plenums.** Electrical *equipment* exposed within a *plenum* shall comply with Sections 602.2.1.4.1 and 602.2.1.4.2.

**602.2.1.4.1 Equipment in metallic enclosures.** Electrical *equipment* with metallic enclosures exposed within a *plenum* shall be permitted.

**602.2.1.4.2 Equipment in combustible enclosures.** Electrical *equipment* with combustible enclosures exposed within a *plenum* shall be *listed* and *labeled* for such use in accordance with UL 2043.

**602.2.1.5 Foam plastic insulation.** Foam plastic insulation used as wall or ceiling finish in plenums shall exhibit a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E 84 or UL 723 and shall also comply with Section 602.2.1.5.1, 602.2.1.5.2 or 602.2.1.5.3.

**602.2.1.5.1 Separation required.** The foam plastic insulation shall be separated from the *plenum* by a thermal barrier complying with Section 2603.4 of the *International Building Code*.

**602.2.1.5.2 Approval.** The foam plastic insulation shall be *approved* based on tests conducted in accordance with Section 2603.9 of the *International Building Code.*

**602.2.1.5.3 Covering.** The foam plastic insulation shall be covered by corrosion-resistant steel having a base metal thickness of not less than 0.0160 inch (0.4 mm).

**602.2.1.6 Semiconductor fabrication areas.** Group H, Division 5 fabrication areas and the areas above and below the fabrication area that share a common air recirculation path with the fabrication area shall not be subject to the provisions of Section 602.2.1.

*******

## SECTION 603

## DUCT CONSTRUCTION AND INSTALLATION

*******

**603.5 Nonmetallic ducts.** Nonmetallic ducts shall be constructed with Class 0 or Class 1 duct material in accordance with UL 181. Fibrous duct construction shall conform to the SMACNA *Fibrous Glass Duct Construction Standards* or NAIMA *Fibrous Glass Duct Construction Standards.* The maximum air temperature within nonmetallic ducts shall not exceed 250ºF (121ºC).

**603.5.1 Gypsum ducts.** The use of gypsum boards to form air shafts (ducts) shall be limited to return air systems where the air temperatures do not exceed 125ºF (52ºC) and the gypsum board surface temperature is maintained above the airstream dew-point temperature as determined by the registered design professional. Air ducts formed by gypsum boards shall not be incorporated in air-handling systems utilizing evaporative coolers.

**Exceptions:**

1. Gypsum boards may be used for ducts that are only used for stairway or elevator pressurization supply air. The gypsum duct shall not attach directly to the equipment.

2. Gypsum boards coated on the inside with epoxy paint or foil-facing may be used for ventilation systems serving parking garages.

3. Gypsum boards coated on the inside with epoxy paint or foil-facing may be used for exhaust air ducts.

**Note:** Gypsum ducts shall be sealed in accordance with Seattle Energy Code Section 1414.

***

**603.9 Joints, seams and connections.** All longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA

*HVAC Duct Construction Standards—Metal and Flexible*, SMACNA *Fibrous Glass Duct Construction Standards*, and NAIMA *Fibrous Glass Duct Construction Standards*. All joints, longitudinal and transverse seams and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants or tapes. Closure systems used to seal ductwork *listed* and *labeled* in accordance with UL 181A shall be marked "181A-P" for pressure-sensitive tape, "181 A-M" for mastic or "181 A-H" for heat-sensitive tape. Closure systems used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181B-FX" for pressure-sensitive tape or "181B-M" for mastic. Duct connections to flanges of air distribution system *equipment* shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked "181B-C." Closure systems used to seal metal ductwork shall be installed in accordance with the manufacturer's installation instructions. Unlisted duct tape is not permitted as a sealant on any metal ducts.

**Exception:** Continuously welded and locking-type longitudinal joints and seams in ducts operating at static pressures less than 2 inches of water column (500 Pa) pressure classification shall not require additional closure systems.

**603.10 Supports.** Ducts shall be supported with *approved* hangers at intervals not exceeding 10 feet (3048 mm) or by other *approved* duct support systems designed in accordance with the *International Building Code*. Flexible and other factory- made ducts shall be supported in accordance with the manufacturer's installation instructions.

**603.10.1 Seismic bracing of ducts.** Longitudinal and transverse bracing is required for ducts 6 square feet (0.56 $m^2$) and larger, including round ducts with a diameter of 34 inches (864 mm) or more, and on all duct systems used for life safety and smoke control installed in either the horizontal or vertical position.

**603.10.1.1 Transverse bracing.** Transverse bracing shall occur at maximum intervals of 30 feet (9144 mm), at each duct turn and at the end of a duct run. Walls, including non-bearing fixed partitions, that have ducts running through them may replace a transverse brace.

**603.10.1.2 Longitudinal bracing.** Longitudinal bracing shall occur at maximum intervals of 60 feet (18 288 mm). Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if bracing is installed within four feet (1219 mm) of the intersection and sized and installed on the larger duct.

**603.10.2 Grouping of ducts.** Groups of ducts may be combined in a larger size frame using overall dimensions and maximum weight of ducts. At least 2 sides of each duct shall be connected to the angles of the brace.

**603.10.3 Seismic loads.** Bracing for ducts shall be designed to resist seismic loading, using accepted engineering practices and Chapter 16 of the *International Building Code.*

**Exception:** No bracing is required if the duct is suspended by hangers 12 inches (305 mm) or less in length as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers shall be positively attached to the duct within 2 inches (51 mm) of the top of the duct with a minimum of two #10 sheet metal screws.

**Interpretation:** Duct bracing that complies with the SMACNA guideline "Seismic Restraint Manual Guidelines for Mechanical Systems" is deemed to comply with Section 603.10.1.

***

**603.14 Location.** Ducts shall not be installed in or within 4 inches (102 mm) of the earth, except where such ducts comply with Section 603.8. Ducts installed in parking garages shall provide a clear floor height of not less than 6 feet 6 inches at the vehicle and pedestrian traffic areas, except where a minimum vertical clearance of 98 inches must be provided for required van-accessible parking spaces, access aisles serving them, and vehicular routes between the van-accessible parking spaces and the garage entrance and exit.

***

## SECTION 604

## INSULATION

**604.1 General.** Duct insulation shall conform to the requirements of ((~~Sections 604.2 through 604.13 and the *International Energy Conservation Code*~~)) the *Washington State Energy Code with Seattle Amendments*.

***

## SECTION 606

## SMOKE DETECTION SYSTEMS CONTROL

***

**606.2 Where required.** Smoke detectors shall be installed where indicated in Sections 601.2, 606.2.1 through 606.2.3.

**Exception:** Smoke detectors shall not be required where air distribution systems are incapable of spreading smoke beyond the enclosing walls, floors and ceilings of the room or space in which the smoke is generated.

**606.2.1 Return air systems.** Smoke detectors shall be installed in return air systems with a design capacity greater than 2,000 cfm (0.9 $m^3/s$), in the return air duct or *plenum* upstream of any filters, *exhaust air* connections, outdoor air connections, or decontamination *equipment* and appliances.

**Exception:** Smoke detectors are not required in the return air system where all portions of the building served by the air distribution system are protected by area smoke detectors connected to a fire alarm system in accordance with the *International Fire Code*. The area smoke detection system shall comply with Section 606.4.

**606.2.2 Common supply and return air systems.** Where multiple air-handling systems share common supply or return air ducts or plenums with a combined design capacity greater than 2,000 cfm (0.9 $m^3/s$), the return air system shall be provided with smoke detectors in accordance with Section 606.2.1.

**Exception:** Individual smoke detectors shall not be required for each fan-powered terminal unit, provided that such units do not have an individual design capacity greater than 2,000 cfm (0.9 $m^3/s$) and will be shut down by activation of one of the following:

1. Smoke detectors required by Sections 601.2, 606.2.1 and 606.2.3.

2. An *approved* area smoke detector system located in the return air *plenum* serving such units.

3. An area smoke detector system as prescribed in the exception to Section 606.2.1.

In all cases, the smoke detectors shall comply with Sections 606.4 and 606.4.1.

[W] The shutdown of fan-powered terminal units may be performed by a building automation system upon activation of smoke detection as described in Section 606.2.2, Exception Items 1, 2, or 3. The building automation system is not required to be listed as a smoke control system and is not required to comply with UL Standard 864: Standard for Control Units and Accessories for Fire Alarm Systems.

**606.2.3 Return air risers.** Where return air risers serve two or more stories and serve any portion of a return air system having a design capacity greater than 15,000 cfm ($7.1 m^3/s$), smoke detectors shall be installed at each story. Such smoke detectors shall be located upstream of the connection between the return air riser and any air ducts or plenums.

***

**606.4 Controls operation.** Upon activation, the smoke detectors shall shut down all operational capabilities of the air distribution system in accordance with the listing and labeling of appliances used in the system. Air distribution systems that are part of a smoke control system shall switch to the smoke control mode upon activation of a detector.

**606.4.1 Supervision.** The duct smoke detectors shall be connected to the building's fire alarm control panel as a supervisory signal ((~~a fire alarm system~~)) where a fire alarm system is required by Section 907.2 of the *International Fire Code*. Duct detectors shall not activate a fire alarm signal. The actuation of a duct smoke detector shall activate a visible and audible supervisory signal at a constantly attended location.

**Exceptions:**

1. The supervisory signal at a constantly attended location is not required where the duct smoke detector activates the building's alarm-indicating appliances.

2. In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and audible signal in an *approved* location. Duct smoke detector trouble conditions shall activate a visible or audible signal in an *approved* location and shall be identified as air duct detector trouble.

***

Section 8. The following sections of Chapter 7 of the International Mechanical Code, 2009 Edition, are amended as follows:

## CHAPTER 7

## COMBUSTION AIR

## SECTION 701

## GENERAL

**701.1 Scope.** This chapter shall apply to those requirements necessary to ensure that adequate air for safe *combustion* is provided for oil-burning *appliances* and *equipment*. Solid fuel-burning *appliances*, *fireplaces*, and *fireplace stoves* shall be provided with *combustion air* in accordance with the appliance manufacturer's installation instructions and *International Building Code* Section 2111. ((~~Oil-fired *appliances* shall be provided with *combustion air* in accordance with NFPA 31. The methods of providing *combustion air* in this chapter do not apply to fireplaces, fireplace stoves and d~~))Direct-vent *appliances* shall be provided with combustion air in

accordance with the appliance manufacturer's installation instructions. The requirements for combustion and dilution air for gas-fired *appliances* shall be in accordance with the *International Fuel Gas Code*.

**701.2 General.** Combustion air ducts shall:

1. Be of galvanized steel complying with Chapter 6 or of equivalent corrosion-resistant material approved for this application.

   **Exception:** Within dwelling units, unobstructed stud and joist spaces shall not be prohibited from conveying combustion air, provided that not more than one required fireblock is removed.

2. Have a minimum cross-sectional dimension of 3 inches (76 mm).

3. Terminate in an unobstructed space allowing free movement of combustion air to the appliances.

4. Have the same cross-sectional areas as the free area of the openings to which they connect.

5. Serve a single appliance enclosure.

6. Not serve both upper and lower combustion air openings where both such openings are used. The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.

7. Not be screened where terminating in an attic space.

8. Not slope downward toward the source of combustion air, where serving the upper required combustion air opening.

**701.3 Prohibited sources.** Openings and ducts shall not connect appliance enclosures with a space in which the operation of a fan will adversely affect the flow of the combustion air. Combustion air shall not be obtained from a hazardous location, except where the fuel-fired appliances are located within the hazardous location and are installed in accordance with this code. Combustion air shall not be taken from a refrigeration machinery room, except where a refrigerant vapor detector system is installed to automatically shut off the combustion process in the event of refrigerant leakage. Combustion air shall not be obtained from any location below the design flood elevation.

**701.4 Opening location and protection.** Combustion air openings to the outdoors shall comply with the location and protection provisions of Sections 401.4 and 401.5 applicable to outdoor air intake openings.

## SECTION 702

## APPLIANCES LOCATED IN UNCONFINED SPACES

**702.1** In *unconfined spaces*, air for combustion and ventilation shall be obtained directly from outdoors or from spaces that freely communicate with outdoors by means of a permanent opening or openings having a total free area of not less than 1 in.$^2$ per 5000 Btu/hr (28 in.$^2$ per gal/hr) (4.4 cm$^2$/kW), based on the total input rating of all appliances in the space.

## SECTION 703

## APPLIANCES LOCATED IN CONFINED SPACES

**703.1** For appliances installed in *confined spaces*, air for combustion and ventilation shall be provided using one of the methods set forth in this section.

**703.2 All Air Taken from Inside the Building.**

**703.2.1** The *confined space* shall be provided with two permanent openings as shown in Figure 703.2.1, one within 1 foot of the top of the space and one within 1 foot of the bottom of the space.

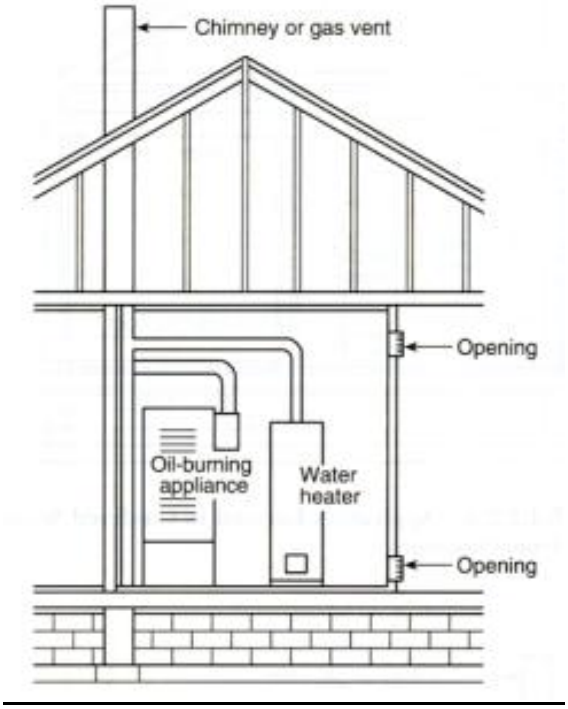


**FIGURE 703.2.1** Appliances Located in Confined Spaces – All Air Taken from Inside the Building

**703.2.2** Each opening shall have a free area of not less than 1 in.² per 1000 Btu/hr (140in.² per gal/hr) (22 cm²/kW), based on the total input rating of all appliances in the space.

**703.2.3** Each opening shall freely communicate with interior areas of the building that, in turn, have adequate infiltration from the outside.

**703.3 All Air Taken from Outdoors.**

**703.3.1** The *confined space* shall be provided with two permanent openings, one within 1 foot of the top of the space and one within 1 foot of the bottom of the space.

**703.3.2** The openings shall communicate directly or by means of ducts with the outdoors or to spaces, such as an attic or crawl space, that themselves freely communicate with the outdoors, as shown in Figure 703.3.2 (a), Figure 703.3.2 (b), and Figure 703.3.2 (c).

**703.3.3** Where communicating with outdoors directly or by means of vertical ducts, each opening shall have a free area of not less than 1 inch² per 4000 Btu/hr (35 inch² per gal/hr) (5.5 cm²/kW), based on the total input rating of all appliances in the space.

**703.3.4** Where communicating with outdoors by means of horizontal ducts or a combination of horizontal and vertical ducts, each opening shall have a free area of not less than 1 inch² per 2000 Btu/hr (70 inch² per gal/hr) (11 cm²/kW), based on the total input rating of all appliances in the space.

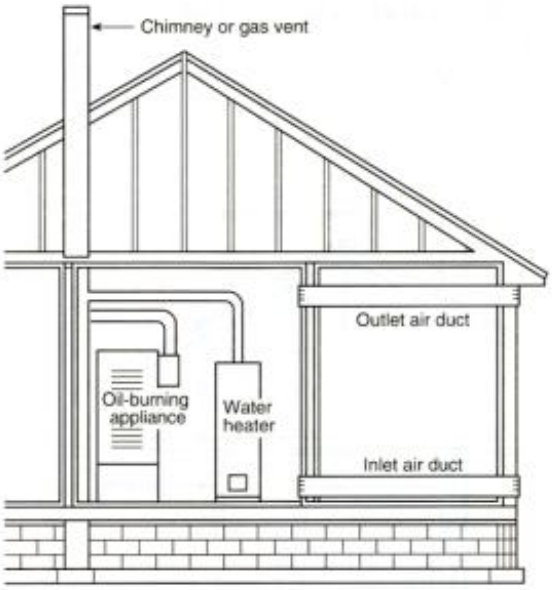


**FIGURE 703.3.2(a)** Appliances Located in Confined Spaces - All Air from Outdoors

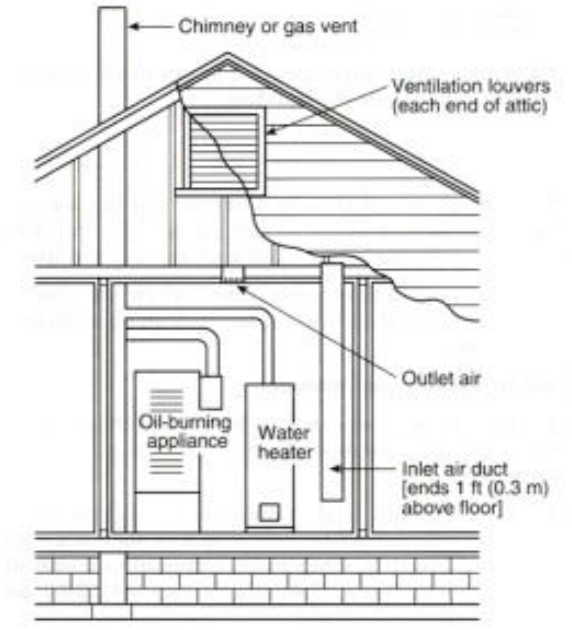

**FIGURE 703.3.2(b)** Appliances Located in Confined Spaces - All Air from Outdoors Through Ventilated Attic

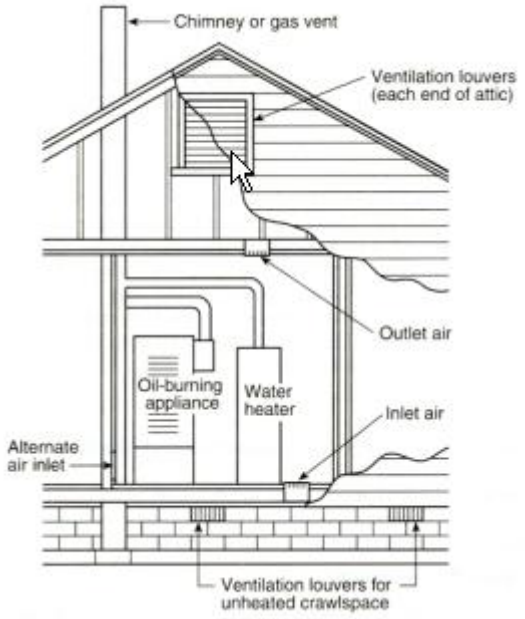


**FIGURE 703.3.2(c)** Appliances Located in Confined Spaces – All Air from Outdoors, with Inlet Air from Ventilated Crawl Space and Outlet Air to Ventilated Attic

## SECTION 704

## OPENING OBSTRUCTIONS

**704.1 General.** The required size of openings for combustion and dilution air shall be based on the net free area of each opening. The net free area of an opening shall be that specified by the manufacturer of the opening covering. In the absence of such information, the blocking effect of louvers, grilles, or screens protecting openings shall be taken into consideration. Openings covered with metal louvers shall be deemed to have a net free area of 75 percent of the area of

the opening, and openings covered with wood louvers shall be deemed to have a net free area of 25 percent of the area of the opening. Louvers and grills shall be fixed in the open position.

**Exception:** Louvers interlocked with the appliance so that they are proven to be in the full open position prior to main burner ignition and during main burner operation. Means shall be provided to prevent the main burner from igniting if the louvers fail to open during burner startup and to shut down the main burner if the louvers close during operation.

**704.2 Screens.** Screens used in louvers or grilles shall not be smaller than ¼ inch (6.3 mm) mesh and shall be accessible for cleaning.

**704.3 Dampered openings.** Where the combustion air openings are provided with volume, smoke or fire dampers, the dampers shall be electrically interlocked with the firing cycle of the appliances served, so as to prevent operation of any appliance that draws combustion and dilution air from the room when any of the dampers are closed. Manually operated dampers shall not be installed in combustion air openings.

## SECTION 705

## FORCED COMBUSTION AIR SUPPLY

**705.1 General.** Where all combustion air and dilution air is provided by a mechanical forced-air system, the combustion air and dilution air shall be supplied at the minimum rate of 1 cfm per 2,400 Btu/h [0.00067 $m^3/(s \cdot kW)$] of combined input rating of all the fuel-burning appliances served. Each of the appliances served shall be electrically interlocked to the mechanical forced-air system so as to prevent operation of the appliances when the mechanical system is not in operation. Where combustion air and dilution air is provided by the building's mechanical

ventilation system, the system shall provide the specified combustion/dilution air rate in addition to the required ventilation air.

Section 9. The following sections of Chapter 8 of the International Mechanical Code, 2009 Edition, are amended as follows:

## CHAPTER 8

## CHIMNEYS AND VENTS

***

## SECTION 804

## DIRECT-VENT, INTEGRAL VENT AND MECHANICAL DRAFT SYSTEMS

***

**804.3 Mechanical draft systems.** Mechanical draft systems of either forced or induced draft design shall comply with Sections 804.3.1 through 804.3.7.

**804.3.1 Forced draft systems.** Forced draft systems and all portions of induced draft systems under positive pressure during operation shall be designed and installed so as to be gas tight to prevent leakage of *combustion* products into a building.

**804.3.2 Automatic shutoff.** Power exhausters serving automatically fired *appliances* shall be electrically connected to each *appliance* to prevent operation of the *appliance* when the power exhauster is not in operation.

**804.3.3 Termination.** The termination of *chimneys* or vents equipped with power exhausters shall be located a minimum of 10 feet (3048 mm) from the lot line or from adjacent buildings. The exhaust shall be directed away from the building.

**804.3.4 Horizontal terminations.** Horizontal terminations shall comply with the following requirements:

1. Where located adjacent to walkways, the termination of mechanical draft systems shall be not less than ((~~7~~)) 10 feet ((~~2134 mm~~)) (3048 mm) above the level of the walkway.

2. Vents shall terminate at least 3 feet (914 mm) above any forced air inlet located within 10 feet (3048 mm).

3. The vent system shall terminate at least 4 feet (1219 mm) below, 4 feet (1219 mm) horizontally from or 1 foot (305 mm) above any door, window or gravity air inlet into the building.

4. The vent termination point shall not be located closer than 3 feet (914 mm) to an interior corner formed by two walls perpendicular to each other.

5. The vent termination shall not be mounted directly above or within 3 feet (914 mm) horizontally from an oil tank vent or gas meter.

6. The bottom of the vent termination shall be located at least 12 inches (305 mm) above finished grade.

**804.3.5 Vertical terminations.** Vertical terminations shall comply with the following requirements:

1. Where located adjacent to walkways, the termination of mechanical draft systems shall be not less than ((~~7~~)) 10 feet (((~~2134 mm~~))) (3048 mm) above the level of the walkway.

2. Vents shall terminate at least 3 feet (914 mm) above any forced air inlet located within 10 feet (3048 mm) ((~~horizontally~~)).

3. Where the vent termination is located below an adjacent roof structure, the termination point shall be located at least 3 feet (914 mm) from such structure.

4. The vent shall terminate at least 4 feet (1219 mm) below, 4 feet (1219 mm) horizontally from or 1 foot (305 mm) above any door, window or gravity air inlet for the building.

5. A vent cap shall be installed to prevent rain from entering the vent system.

6. The vent termination shall be located at least 3 feet (914 mm) horizontally from any portion of the roof structure.

**804.3.6 Exhauster connections.** An *appliance* vented by natural draft shall not be connected into a vent, *chimney* or vent connector on the discharge side of a mechanical flue exhauster.

**804.3.7 Exhauster sizing.** Mechanical flue exhausters and the vent system served shall be sized and installed in accordance with the manufacturer's installation instructions.

**804.3.8 Mechanical draft systems for manually fired appliances and fireplaces.** A mechanical draft system shall be permitted to be used with manually fired appliances and fireplaces where such system complies with all of the following requirements:

1. The mechanical draft device shall be *listed* and installed in accordance with the manufacturer's installation instructions.

2. A device shall be installed that produces visible and audible warning upon failure of the mechanical draft device or loss of electrical power, at any time that the mechanical draft device is turned on. This device shall be equipped with a battery backup if it receives power from the building wiring.

3. A smoke detector shall be installed in the room with the *appliance* or fireplace. This device shall be equipped with a battery backup if it receives power from the building wiring.

***

Section 10. The following sections of Chapter 9 of the International Mechanical Code, 2009 Edition, are amended as follows:

## CHAPTER 9

## SPECIFIC APPLIANCES, FIREPLACES AND SOLID FUEL-BURNING EQUIPMENT

***

## SECTION 908

## COOLING TOWERS, EVAPORATIVE CONDENSERS AND FLUID COOLERS

***

**908.5 Water supply.** Water supplies and protection shall be as required by the ((~~*International*~~)) *Uniform Plumbing Code*.

***

## SECTION 918

## FORCED-AIR WARM-AIR FURNACES

***

**918.6 Prohibited sources.** Outdoor or return air for a forced-air heating system shall not be taken from the following locations:

1. Less than 10 feet (3048 mm) from an *appliance* vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outdoor air inlet.

2. Where there is the presence of objectionable odors, fumes or flammable vapors; or where located less than 10 feet (3048 mm)above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley or driveway.

3. A hazardous or insanitary location or a refrigeration *machinery room* as defined in this code.

4. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with Sections 918.2 and 918.3, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of such rooms or spaces.

**Exception:** The minimum volume requirement shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to such room or space.

5. A closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

**Exception:** Where return air intakes are located not less than 10 feet (3048 mm) from cooking appliances, and serve the kitchen area only, taking return air from a kitchen shall not be prohibited.

6. ((~~An unconditioned~~)) A crawl space. ((~~by means of direct connection to the return side of a forced air system. Transfer openings in the crawl space enclosure shall not be prohibited.~~))

7. A room or space containing a fuel-burning *appliance* where such room or space serves as the sole source of return air.

**Exceptions:**

7.1. This shall not apply where the fuel-burning *appliance* is a direct-vent *appliance*.

7.2. This shall not apply where the room or space complies with the following requirements:

7.2.1. The return air shall be taken from a room or space having a volume exceeding 1 cubic foot for each 10 Btu/h (9.6 L/W) of combined input rating of all fuel-burning appliances therein.

7.2.2. The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space.

7.2.3. Return-air inlets shall not be located within 10 feet (3048 mm) of any *appliance* firebox or draft hood in the same room or space.

7.3. This shall not apply to rooms or spaces containing solid-fuel-burning appliances, provided that return-air inlets are located not less than 10 feet (3048 mm) from the firebox of the appliances.

***

Section 11. The following sections of Chapter 11 of the International Mechanical Code, 2009 Edition, are amended as follows:

**CHAPTER 11**

**REFRIGERATION**

**SECTION 1101**

**GENERAL**

*******

**1101.4 Water connection.** Water supply and discharge connections associated with refrigeration systems shall be made in accordance with this code and the ((~~*International*~~)) *Uniform Plumbing Code*.

*******

**SECTION 1104**

**SYSTEM APPLICATION REQUIREMENTS**

*******

**1104.2 Machinery room.** Except as provided in Sections 1104.2.1 and 1104.2.2, all components containing the refrigerant shall be located either outdoors or in a *machinery room* where the quantity of refrigerant in an independent circuit of a system exceeds the amounts shown in Table 1103.1. For refrigerant blends not listed in Table 1103.1, the same requirement shall apply when the amount for any blend component exceeds that indicated in Table 1103.1 for that component. This requirement shall also apply when the combined amount of the blend components exceeds a limit of 69,100 parts per million (ppm) by volume. Machinery rooms required by this section

shall be constructed and maintained in accordance with Section 1105 for Group A1 and B1 refrigerants and in accordance with Sections 1105 and 1106 for Group A2, B2, A3 and B3 refrigerants.

**Exceptions:**

1. Machinery rooms are not required for *listed equipment* and appliances containing not more than 6.6 pounds (3 kg) of refrigerant, regardless of the refrigerant's safety classification, where installed in accordance with the equipment's or appliance's listing and the *equipment* or *appliance* manufacturer's installation instructions.

2. Piping in conformance with Section 1107 is allowed in other locations to connect components installed in a *machinery room* with those installed outdoors.

**1104.2.1 Institutional occupancies.** The amounts shown in Table 1103.1 shall be reduced by 50 percent for all areas of institutional occupancies except kitchens, laboratories and mortuaries. The total of all Group A2, B2, A3 and B3 refrigerants shall not exceed 550 pounds (250 kg) in occupied areas or machinery rooms.

**1104.2.2 Industrial occupancies and refrigerated rooms.** This section applies only to industrial occupancies and refrigerated rooms for manufacturing, food and beverage preparation, meat cutting, other processes and storage. Machinery rooms are not required where all of the following conditions are met:

1. The space containing the machinery is separated from other occupancies by tight construction with tight-fitting doors.

2. Access is restricted to authorized personnel.

3. The floor area per occupant is not less than 100 square feet (9.3 $m^2$) where machinery is located on floor levels with exits more than 6.6 feet (2012 mm) above the ground. Where provided with egress directly to the outdoors or into *approved* building exits, the minimum floor area shall not apply.

4. Refrigerant detectors are installed as required for machinery rooms in accordance with Section 1105.3.

5. Surfaces having temperatures exceeding 800°F (427°C) and open flames are not present where any Group A2, B2, A3 or B3 refrigerant is used (see Section 1104.3.4).

6. All electrical *equipment* and appliances conform to Class 1, Division 2, *hazardous location* classification requirements of ((~~NFPA 70~~)) the *Seattle Electrical Code* where the quantity of any Group A2, B2, A3 or B3 refrigerant, other than ammonia, in a single independent circuit would exceed 25 percent of the lower flammability limit (LFL) upon release to the space.

7. All refrigerant-containing parts in systems exceeding 100 horsepower (hp) (74.6 kW) drive power, except evaporators used for refrigeration or dehumidification; condensers used for heating; control and pressure relief valves for either; and connecting piping, shall be located either outdoors or in a *machinery room*.

*******

**SECTION 1105**

**MACHINERY ROOM, GENERAL REQUIREMENTS**

***

**[F] 1105.3 Refrigerant detector.** ((~~Refrigerant detectors in machinery rooms shall be provided as required by Section 606.8 of the *International Fire Code*.~~))

Refrigeration machinery rooms shall contain a refrigerant detector. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in the International Mechanical Code for the refrigerant classification. Detectors and alarms shall be placed in approved locations.

The detector shall activate an alarm system utilizing listed and approved fire alarm signaling devices, both audible and visible. The audible and visible alarm devices shall be distinct from the building's fire alarm system (if present). The sound levels shall meet the requirements of Section 907.5.2.1 and visible alarms shall be located in accordance with Section 907.5.2.3.

The system shall also comply with the mechanical ventilation requirements for emergency conditions in accordance with Section 1105.6.4.

***

**1105.6 Ventilation.** Machinery rooms shall have continuous mechanical ventilation ((~~be mechanically ventilated~~)) to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air both at normal operating and emergency conditions. Multiple fans or multispeed fans shall be allowed in order to produce the emergency ventilation rate and to obtain a reduced airflow for normal ventilation.

**Interpretation:** The requirement for continuous mechanical ventilation to the outdoors means that fire dampers are not allowed on machinery room ventilation ducts.

**Exception:** Where a refrigerating system is located outdoors more than 20 feet (6096 mm) from any building opening and is enclosed by a penthouse, lean-to or other open structure, natural or mechanical ventilation shall be provided. Location of the openings shall be based on the relative density of the refrigerant to air. The free-aperture cross section for the ventilation of the *machinery room* shall be not less than:

$F = \sqrt{G}$ **(Equation 11-1)**

For SI: $F = 0.138\sqrt{G}$

where:

$F$ = The free opening area in square feet ($m^2$).

$G$ = The mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the *machinery room*.

**1105.6.1 Discharge location.** The discharge of the air shall be to the outdoors in accordance with Chapter 5. Exhaust from mechanical ventilation systems shall be discharged not less than 20 feet (6096 mm) from a property line or openings into buildings.

**1105.6.2 Makeup air.** Provisions shall be made for *makeup air* to replace that being exhausted. Openings for *makeup air* shall be located to avoid intake of *exhaust air*. Supply and exhaust ducts to the *machinery room* shall serve no other area, shall be constructed in accordance with

Chapter 5 and shall be covered with corrosion-resistant screen of not less than 1/4-inch (6.4 mm) mesh.

**1105.6.3 Quantity—normal ventilation.** During occupied conditions, the mechanical ventilation system shall exhaust the larger of the following:

1. Not less than 0.5 cfm per square foot (0.0025 $m^3/s \cdot m^2$) of *machinery room* area or 20 cfm (0.009 $m^3/s$) per person; or

2. A volume required to limit the room temperature rise to 18°F (10°C) taking into account the ambient heating effect of all machinery in the room.

**1105.6.4 Quantity—emergency conditions.** Upon actuation of the refrigerant detector required in Section 1105.3, the mechanical ventilation system shall *exhaust air* from the *machinery room* in the following quantity:

$Q = 100 \times \sqrt{G}$ **(Equation 11-2)**

For SI: $Q = 0.07 \times \sqrt{G}$

where:

$Q$ = The airflow in cubic feet per minute ($m^3/s$).

$G$ = The design mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the *machinery room*.

**[F] 1105.6.5 Standby source of power required.** Where treatment, detection, continuous ventilation, or alarm systems are required, such systems shall be connected to a legally-required standby source of power to supply electrical power in the event of loss of power from the primary

source. See the *International Fire Code* Section 604.2 and Chapter 27 and *Seattle Electrical Code* Article 701.

**1105.7 Termination of relief devices.** Pressure relief devices, fusible plugs and purge systems located within the *machinery room* shall terminate outside of the structure at a location not less than 15 feet (4572 mm)above the adjoining grade level and not less than 20 feet (6096 mm) from any window, ventilation opening or exit.

For additional requirements regarding termination of relief devices for flammable refrigerants, toxic and highly toxic refrigerants, ammonia refrigerant, treatment systems, flaring systems, and ammonia diffusion systems, see Section 606.11 of the *International Fire Code*.

***

**SECTION 1106**

**MACHINERY ROOM, SPECIAL REQUIREMENTS**

***

**1106.3 Ammonia room ventilation.** Ventilation systems in ammonia machinery rooms shall be operated continuously at the ((~~emergency~~)) normal ventilation rate determined in accordance with Section 1105.6.4.

**Exception((s)):**

((~~1. Machinery rooms equipped with a vapor detector that will automatically start the ventilation system at the emergency rate determined in accordance with Section 1105.6.4, and that will actuate an alarm at a detection level not to exceed 1,000 ppm; or~~

~~2.~~)) Machinery rooms conforming to the Class 1, Division 2, *hazardous location* classification requirements of ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**1106.4 Flammable refrigerants.** Where refrigerants of Groups A2, A3, B2 and B3 are used, the *machinery room* shall conform to the Class 1, Division 2, *hazardous location* classification requirements of ((~~NFPA 70~~)) the *Seattle Electrical Code*.

**Exception:** Ammonia machinery rooms, but not including ventilation fan motors.

***

**[F] 1106.7 Alarm activation.** Where continuous ventilation is provided, failure of the ventilation system shall automatically activate an audible and visual alarm.

**SECTION 1107**

**REFRIGERANT PIPING**

***

**1107.5 Materials for refrigerant pipe and tubing.** Piping materials shall be as set forth in Sections 1107.5.1 through 1107.5.5.

**1107.5.1 Steel pipe.** Carbon steel pipe with a wall thickness not less than Schedule 80 shall be used for Group A2, A3, B2 or B3 refrigerant liquid lines for sizes 1.5 inches (38 mm) and smaller. Carbon steel pipe with a wall thickness not less than Schedule 40 shall be used for Group A1 or B1 refrigerant liquid lines 6 inches (152 mm) and smaller, Group A2, A3, B2 or B3 refrigerant liquid lines sizes 2 inches (51 mm) through 6 inches (152 mm) and all refrigerant suction and discharge lines 6 inches (152 mm) and smaller. ((~~Type F steel pipe shall not be used for refrigerant~~)) Refrigerant lines having an operating temperature less than -20°F (-29°C) shall

be designed to meet the requirements of ASME B31.5-2001, *Refrigeration Piping and Heat Transfer*.

**1107.5.2 Copper and brass pipe.** Standard iron-pipe size, copper and red brass (not less than 80-percent copper) pipe shall conform to ASTM B 42 and ASTM B 43.

**1107.5.3 Copper tube.** Copper tube used for refrigerant piping erected on the premises shall be seamless copper tube of Type ACR (hard or annealed) complying with ASTM B 280. Where *approved*, copper tube for refrigerant piping erected on the premises shall be seamless copper tube of Type K, L or M (drawn or annealed) in accordance with ASTM B 88. Annealed temper copper tube shall not be used in sizes larger than a 2-inch (51 mm) nominal size. Mechanical joints shall not be used on annealed temper copper tube in sizes larger than 7/8-inch (22.2 mm) OD size.

**1107.5.4 Copper tubing joints.** Copper tubing joints used in refrigerating systems containing Group A2, A3, B2 or B3 refrigerants shall be brazed. Soldered joints shall not be used in such refrigerating systems.

**1107.5.5 Aluminum tube.** Type 3003-0 aluminum tubing with high-pressure fittings shall not be used with methyl chloride and other refrigerants known to attack aluminum.

***

**1107.8 Stop valves.** All systems containing more than 6.6 pounds (3 kg) of a refrigerant in systems using positive-displacement compressors shall have stop valves installed as follows:

1. At the inlet of each compressor, compressor unit or condensing unit.

2. At the discharge outlet of each compressor, compressor unit or condensing unit and of each liquid receiver.

**Exceptions:**

1. Systems that have a refrigerant pumpout function capable of storing the entire refrigerant charge in a receiver or heat exchanger.

2. Systems that are equipped with provisions for pumpout of the refrigerant using either portable or permanently installed recovery *equipment*.

3. Self-contained systems.

**1107.8.1 Liquid receivers.** All systems containing 100 pounds (45 kg) or more of a refrigerant, other than systems utilizing nonpositive displacement compressors, shall have stop valves, in addition to those required by Section 1107.8, on each inlet of each liquid receiver. Stop valves shall not be required on the inlet of a receiver in a condensing unit, nor on the inlet of a receiver which is an integral part of the condenser.

Ammonia systems shall be provided with liquid receivers designed for pumpdown that have sufficient capacity to assure that the liquid does not occupy more than 90 percent of the volume of the receiver at $90^{o}$F.

**1107.8.2 Copper tubing.** Stop valves used with soft annealed copper tubing or hard-drawn copper tubing 7/8-inch (22.2 mm) OD standard size or smaller shall be securely mounted, independent of tubing fastenings or supports.

**1107.8.3 Identification.** Stop valves shall be identified where their intended purpose is not obvious. Numbers shall not be used to label the valves, unless a key to the numbers is located near the valves.

*******

Section 12. The following sections of Chapter 12 of the International Mechanical Code, 2009 Edition, are amended as follows:

**CHAPTER 12**

**HYDRONIC PIPING**

**SECTION 1201**

**GENERAL**

**1201.1 Scope.** The provisions of this chapter shall govern the construction, installation, *alteration* and repair of hydronic piping systems. This chapter shall apply to hydronic piping systems that are part of heating, ventilation and air-conditioning systems. Such piping systems shall include steam, hot water, chilled water, steam condensate and ground source heat pump loop systems. Potable cold and hot water distribution systems shall be installed in accordance with the ((~~*International*~~)) *Uniform Plumbing Code*.

*******

**SECTION 1204**

**PIPE INSULATION**

**1204.1 Insulation characteristics.** Pipe insulation installed in buildings shall conform to the requirements of the ((~~*International Energy Conservation Code*~~)) *Washington State Energy Code*

*with Seattle Amendments*; shall be tested in accordance with ASTM E 84 or UL 723, using the specimen preparation and mounting procedures of ASTM E 2231; and shall have a maximum flame spread index of 25 and a smoke-developed index not exceeding 450. Insulation installed in an air *plenum* shall comply with Section 602.2.1.

**Exception:** The maximum flame spread index and smoke-developed index shall not apply to one- and two-family dwellings.

**1204.2 Required thickness.** Hydronic piping shall be insulated to the thickness required by the ((~~*International Energy Conservation Code*~~)) *Washington State Energy Code with Seattle Amendments*.

***

**SECTION 1206**

**PIPING INSTALLATION**

***

**1206.2 System drain down.** Hydronic piping systems shall be designed and installed to permit the system to be drained. Where the system drains to the plumbing drainage system, the installation shall conform to the requirements of the ((~~*International*~~)) *Uniform Plumbing Code*.

**Exception:** The buried portions of systems embedded underground or under floors.

**1206.3 Protection of potable water.** The potable water system shall be protected from backflow in accordance with the ((~~*International*~~)) *Uniform Plumbing Code*.

***

**SECTION 1209**

**EMBEDDED PIPING**

***

**1209.5 Thermal barrier required.** Radiant floor heating systems shall be provided with a thermal barrier in accordance with Sections 1209.5.1 through 1209.5.4.

**Exception:** Insulation shall not be required in engineered systems where it can be demonstrated that the insulation will decrease the efficiency or have a negative effect on the installation.

**1209.5.1 Slab-on-grade installation.** Radiant piping utilized in slab-on-grade applications shall be provided with insulating materials installed beneath the piping having a minimum *R*-value ((~~of 5.~~)) in accordance with the *Seattle Energy Code*.

**1209.5.2 Suspended floor installation.** In suspended floor applications, insulation shall be installed in the joist bay cavity serving the heating space above and shall consist of materials having a minimum *R*-value ((~~of 11.~~)) in accordance with the *Seattle Energy Code*.

**1209.5.3 Thermal break required.** A thermal break shall be provided consisting of asphalt expansion joint materials or similar insulating materials at a point where a heated slab meets a foundation wall or other conductive slab.

**1209.5.4 Thermal barrier material marking.** Insulating materials utilized in thermal barriers shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

Section 13. The following sections of Chapter 14 of the International Mechanical Code, 2009 Edition, are amended as follows:

**CHAPTER 14**

**SOLAR SYSTEMS**

**SECTION 1401**

**GENERAL**

**1401.1 Scope.** This chapter shall govern the design, construction, installation, *alteration* and repair of systems, *equipment* and appliances intended to utilize solar energy for space heating or cooling, domestic hot water heating, swimming pool heating or process heating. Photovoltaic solar systems that generate electricity shall be installed in accordance with *International Building Code* and Article 690 of the *Seattle Electrical Code.* Systems interconnected to the electric grid shall comply with additional requirements of Seattle City Light.

**Note:** See the Seattle Boiler and Pressure Vessel Code for regulations applicable to boilers and pressure vessels, and the Uniform Plumbing Code for regulations applicable to water heaters.

**1401.2 Potable water supply.** Potable water supplies to solar systems shall be protected against contamination in accordance with the ((~~*International*~~)) *Uniform Plumbing Code*.

**Exception:** Where all solar system piping is a part of the potable water distribution system, in accordance with the requirements of the ((~~*International*~~)) *Uniform Plumbing Code*, and all components of the piping system are *listed* for potable water use, cross-connection protection measures shall not be required.

***

Section 14. The provisions of this ordinance are declared to be separate and severable. The invalidity of any clause, sentence, paragraph, subdivision, section or portion of this

ordinance, or the invalidity of the application thereof to any person, owner, or circumstance shall not affect the validity of the remainder of this ordinance, or the validity of its application to other persons, owners, or circumstances.

Section 15. Sections 2-12 of Ordinance 122531 are repealed.

Section 16. For a period of 60 days following the effective date of this ordinance, the Director may also accept and thereafter approve applications that are designed to comply with either the requirements of this Ordinance or the requirements of Ordinance 122531.

Section 17. This ordinance shall take effect and be in force 30 days from and after its approval by the Mayor, but if not approved and returned by the Mayor within ten days after presentation, it shall take effect as provided by Seattle Municipal Code Section 1.04.020.

Passed by the City Council the ____ day of _____, 2010, and signed by me in open session in authentication of its passage this _____ day of _____, 2010.

_____
President _____of the City Council

Approved by me this ____ day of _____, 2010.

_____
Michael McGinn, Mayor

Filed by me this ____ day of _____, 2010.

_____
City Clerk

(Seal)